SOIL SURVEY OF CAYUGA COUNTY, NEW YORK

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DESCRIPTION OF THE AREA

Cayuga County lies near the center of the Finger Lakes region of central New York, being bounded partly by two of these lakes, Cayuga and Skaneateles. Its northwestern boundary is Lake Ontario, from which it extends south about 60 miles. It comprises an area of 703 square miles or 449,920 acres.

The county is quite variable in topography and elevation. The lowest land is along Lake Ontario, which has an elevation of 246 feet above sea level. The southeastern part, locally referred to as the "hill section," has a general elevation of 1,200 to 1,500 feet, with hills rising from 1,500 to more than 1,800 feet above sea level.

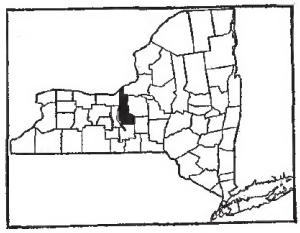


FIG. 31.—Sketch map showing location of the Cayuga County area, New York

The southern part of the county is an extension of the Allegheny Plateau, which has been influenced by glaciation and the carving out of stream courses and has been thoroughly dissected. Dutch Hollow Brook, Fall and Salmon Creeks, and Owasco Inlet have cut deep valleys. During the glacial period these valleys were occupied by ice lobes and much débris was deposited. The broader divides between the drainage ways represent parts of the former high plateau.

All the county was affected by the movement of glacial ice from the north, which scoured off some of the higher ridges and deposited a layer of till of varying thickness over all the area. In many places in the valleys the deposit is very deep. On the higher lying country, like the hilly southeastern part, glacial action was very feeble and the deposit is thin as compared with that in the northern and north-central parts of the county.

The physiographic belts of the county comprise the following main divisions: (1) The hilly section or high rolling country in the southeastern part of the county; (2) the gently rolling to undulating ground moraine country in the vicinity of and south and southeast of Auburn; (3) the lake-laid deposits forming smooth to nearly level terraces in the vicinity of and north of Auburn; (4) the typical drumlins or hills of the north-central part of the county; (5) the old terraces and beaches of comparatively smooth land, associated

with drumlins and some gently sloping to rolling lake-laid deposits in the northern part of the county; and (6) the terraces and first-bottoms along the Seneca River.

In the hilly southeastern part, which is thoroughly dissected, the topography ranges from rolling or gently sloping to hilly, with some steep slopes and little or no level land. A few of the broad divides are gently rolling to comparatively smooth, such as the area between Owasco Inlet and the drainage into Como Lake. The slopes along Owasco Inlet are steep and broken, with a drop of 300 to 400 feet from the level of the uplands to the valley proper. The slopes along Salmon Creek in the southern part of the county, and along the main valley near Como Lake in the southeastern part, are also steep and broken. The material deposited by glacial action as moraines, kames, and lake-laid material in the main or through valleys is gently sloping, rolling, or hilly to morainic and knobby.

In the south-central part near King Ferry and Poplar Ridge, on the east side of Owasco Lake near Owasco, and extending north through Auburn to Sennett on the east and Cayuga on the west, the topography is comparatively smooth and gently rolling to undulating, representing ground moraines deposited by ice action.

In the vicinity of Auburn and Cayuga is a comparatively smooth plain in which the soil material consists of sediment deposited in lakes as the ice lobes were retreating to the north. Here the surface is comparatively smooth, with slight depressions and ridges.

Through the north-central part of the county occurs a typically developed belt of drumlin topography, consisting of elongated ridges or hills with a north-south trend. These drumlins occur in groups or singly, and when viewed from a distance present a billowy appearance. They are usually rather steep on the north-facing slope and on the sides of the crest, but the southern slope is long and gradual. The interdrumlin region is gently rolling to undulating. The drumlins rise from 150 to 200 feet above the general level of the surrounding country and have an elevation of 450 to 500 feet above sea level.

The Seneca River passes through this drumlin region. A belt of smooth to flat land, consisting largely of lake-laid and recent-alluvial material, parallels the river. For several miles north of the Seneca River, and extending to Westbury on the west and Bethel Corners on the east, the country is characterized by a drumlin topography, with some smooth areas of lake-laid material. Much flat, poorly drained land occurs near Duck and Otter Lakes. The country north and east of Westbury is smooth to undulating terrace or bench land, representing material deposited and reworked by waters of old Lake Iroquois, which was 450 to 460 feet above sea level.

The topography in the northern part of the county has been influenced considerably by deposition of lake-laid material, and the surface is smooth and gently sloping to terracelike. In the extreme northern part the topography is rolling or gently sloping to hilly. Some typical drumlins similar to those of the central part occur in this section.

The elevation of the smooth bottom and terrace lands along the Seneca River ranges from 380 to 400 feet above sea level, while the

general elevation in the vicinity of Auburn and south through Poplar Ridge ranges from 725 to slightly more than 1,000 feet above sea level.

Drainage is good in most of the hilly section, especially on the Lordstown soils, but internal drainage is not so good on the Volusia soils. Surface run-off is good as a whole, and in some places is excessive and so rapid as to form gullies. The gently rolling to undulating country south and southwest of Auburn is well drained. Through the belt of lake-laid soils in the vicinity of Auburn the drainage is not so thorough because of the flat topography. The typical drumlin region is well drained, with the exception of the low-lying Muck and Marsh soils. The northern part of the county is well drained as a whole, except for a few areas of Marsh and Muck and some flat-topped ridges or lake terraces.

All the drainage of Cayuga County eventually flows into Lake Ontario. The southwestern part drains into Lake Cayuga, which is drained by the Seneca River. The south-central portion of the county is drained into Owasco Lake, which flows into the Seneca River through Owasco Outlet. Skaneateles Lake, which forms a part of the eastern boundary, receives a small proportion of the drainage of the adjacent region. Most of the central part of the county and the drumlin area is drained into the Seneca River. The extreme northern part of the area is drained directly into Lake Ontario through Blind Sodus and Little Sodus Creeks. Although the greater part of the county is well drained, there are many small areas of Muck, Marsh, and Meadow throughout the county in which drainage is deficient.

The drainage courses of the southern part of the county occupy through valleys that were scoured out largely by ice during the glacial period. In some places the drainage channels lie 300 to 500 feet below the general level of the uplands. The streams of the north-central part of the county are sluggish and their channels lie only a few feet below the level of the terrace and bottom soils.

Cayuga Lake has an elevation of 381 feet above sea level; Owasco Lake, 710 feet; and Skaneateles Lake, 784 feet. Seneca River is rather sluggish and has an elevation of about 380 feet above sea level. The New York State Barge Canal follows the course of the river much of the way across the county.

The first settlements in this region were made soon after the close of the Revolutionary War. Originally all this section of the State was included in Montgomery County, which was divided into several counties, from one of which (Onondaga), Cayuga County was formed in 1799.

The first white settlers came to Aurora, on Cayuga Lake, in 1789, when the territory was known as the Onondaga Military Tract. When soldiers connected with the expedition of General Sullivan, which came to this part of New York in 1778–79, returned to their homes they carried back descriptions of the central New York region and told of the wonderful productiveness of the land. These stories resulted in many settlers flocking to these sections; the lands were taken up very fast, and small settlements started up in many localities. Many soldiers of the Revolutionary War were given grants of 500 acres or more. The first settlement near the present site of

Auburn was begun in the latter part of the eighteenth century by settlers from Pennsylvania, although the larger part of the early settlers came from the New England States, principally Massachusetts and Connecticut. All the lands originally were forested and had to be cleared before crops could be raised. Indian trails were plentiful, but were impassable much of the time and could not be used for wagon transportation. The early part of the nineteenth century was marked by much progress in the building of roads and the opening up of new sections to transportation.

According to the Federal census, the population of the county was 65,081 in 1880; 65,302 in 1890; 66,234 in 1900; 67,107 in 1910; and 65,221 in 1920. The population as a whole has changed very little in the last 40 years. In 1910, 51.7 per cent of it was classed as rural, whereas, in 1920, 44.5 per cent was so classed. The rural population averages 41.3 persons to the square mile.

Auburn, the county seat, is the largest city in the county, with a population of 36,192. Weedsport and Moravia are next in importance, having populations of 1,379 and 1,331, respectively. Union Springs, Aurora, Cayuga, Locke, Genoa, Venice Center, Port Byron, Cato, and Fairhaven are smaller towns located in the county. Many other small towns and communities serve as trading points. Auburn is a manufacturing town with many and varied industries, the leading manufactured product being farm machinery.

Transportation facilities in the county are exceptionally good. Two lines of the Lehigh Valley Railroad enter the county from the south, one following along Cayuga Lake and the other passing through Locke and Moravia along Owasco Lake to Auburn. A line leads north through Cato, having its terminus at North Fairhaven on Lake Ontario. The main line of the New York Central system passes through the north-central part of the county, and the West Shore Railroad, a part of the same system, traverses the north-central part of the county from east to west. Another branch of the New York Central (Auburn Road) passes through Cayuga and Auburn, and still another, extending from Rochester to Ogdensburg passes through the northern part of the county. The Auburn & Syracuse Electric, Empire State Electric, and Rochester & Syracuse Electric roads serve the north-central part of the area. The new Barge Canal crosses the county and connects it with Buffalo on the west and Syracuse and other points to the east. The southeastern hilly section is not as well supplied with transportation as the rest of the area.

The county has an extensive system of public roads, the principal roads being surfaced, macadamized, or concrete. All the main roads are improved. The hilly southeastern part of the county is not as well provided with good roads as the more prosperous farming sections.

The towns of the county, especially Auburn, are the principal markets for farm products. Milk is shipped to New York City and also some of the vegetables. Syracuse is a market for much of the truck crops produced in the county.

All parts of the county are well supplied with schools, rural mail delivery, and telephone service. The general appearance of the farms and farm improvements in this county indicate a condition of prosperity.

CLIMATE

The prevailing climatic conditions vary somewhat in different parts of Cayuga County, owing to the fact that its territory has a north and south extent of about 60 miles and includes a range in elevation of more than 1,550 feet.

At Auburn, situated in the central part of the county at an elevation of 715 feet above sea level, the mean annual temperature is 47.2° F. The maximum temperature recorded is 100° F. and the minimum temperature recorded —18° F. Lake Ontario influences the climate of the northern part of the county to a considerable extent, the summer months being slightly cooler than in the inland section to the south and farther from the Lake. The mean annual temperature recorded at Oswego, on Lake Ontario, in Oswego County, the records of which represent conditions along the lake in Cayuga County is 46.8° F. The absolute maximum is 100° F., and the minimum —22° F.

The winter months over the county generally are accompanied by much snowfall, the snow remaining on the ground for much of the time during December, January, February, and March. The high hilly section in the southeastern part of the county is colder than the section represented by Auburn, and the snowfall is correspondingly heavier.

The mean annual precipitation as recorded at Auburn is 36.80 inches, the heaviest precipitation being recorded during May, June, July, and August, when it is needed by growing crops. The lightest precipitation occurs during the winter months. The mean precipitation at Oswego for the four months above noted is about 2½ inches less than at Auburn. There does not appear to be as much rainfall along the lake as there is to the south and farther inland. The rainfall is well distributed over the growing season and crops rarely suffer for lack of moisture.

The average date of the last killing frost in the spring at Auburn is May 5 and at Oswego is April 25, and the average date of the first in the fall is October 14 at Auburn and October 22 at Oswego. The average growing season or frost-free period is about 161 days at Auburn and about 18 days longer at Oswego. The latest frost in spring at Auburn occurred on May 27 and the earliest in the fall on September 15 and at Oswego, on May 29 and September 25, respectively. The region along Lake Ontario is therefore more free from erratic frost occurrence than the sections farther south, and consequently the lake region is more desirable for fruit growing.

As a whole the climatic conditions which prevail in this section are favorable for the growing and maturing of a wide range of crops.

The following tables give the normal monthly, seasonal, and annual temperature and precipitation as recorded by the Weather Bureau station at Auburn, in the central part of the county at an elevation of approximately 715 feet above sea level, and at Oswego, in Oswego County on Lake Ontario, at an elevation 335 feet above sea level.

Normal monthly, seasonal, and annual temperature and precipitation at Auburn

[Elevation, 715 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1838)	Total amount for the wettest year (1843)
	° F.	° F.	° F.	Inches	Inches	Inches
December	29.0	64	−16	2.70	1.15	4.22
January	24.3	70	−17	2.62	1.13	2.74
February	24.2	65	−18	2.17	1.78	2.12
Winter	25.8	70	−18	7.49	4.06	9.08
March	32.8	83	−16	2.46	1.30	3.89
April	45.0	87	14	2.58	.99	3.61
May	56.6	95	25	3.60	1.20	5.12
Spring	44.8	95	−16	8.64	3.49	12.62
June	65.6	98	35	3.92	3.00	3.49
July	70.5	100	43	3.75	2.50	2.09
August	68.7	98	42	3.50	2.64	3.78
Summer	68.3	100	35	11.17	8.14	9.36
September	61.3	95	31	3.23	1.70	6.14
October	50.0	90	19	3.32	2.35	6.40
November	38.6	72	8	2.95	2.00	6.22
Fall	50.0	95	8	9.50	6.05	18.76
Year	47.2	100	−18	36.80	21.74	49.82

Normal monthly, seasonal, and annual temperature and precipitation at Oswego, Oswego County

[Elevation, 335 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1887)	Total amount for the wettest year (1863)
	° F.	° F.	° F.	Inches	Inches	Inches
December	29.2	66	−21	3.59	2.28	3.75
January	23.9	69	−22	3.16	.92	3.61
February	24.0	61	−18	2.65	3.48	2.80
Winter	25.7	69	−22	9.40	6.68	10.16
March	31.4	78	−11	2.84	1.21	2.82
April	43.2	85	11	2.26	1.58	6.25
May	54.7	94	27	2.85	1.03	5.00
Spring	43.1	94	−11	7.95	3.82	14.07
June	63.8	98	39	3.43	2.72	4.00
July	69.6	100	45	3.23	1.82	4.35
August	68.8	98	44	2.69	1.69	5.25
Summer	67.4	100	39	9.35	6.23	13.60
September	62.7	93	35	2.81	1.91	4.45
October	51.2	84	24	3.34	2.39	5.48
November	39.1	75	−1	3.41	2.38	8.40
Fall	51.0	93	−1	9.56	6.68	18.33
Year	46.8	100	−22	36.26	23.41	56.16

AGRICULTURE

Agriculture has always been the principal industry of Cayuga County. All the present farm land of the county originally was forested with hardwoods and pine, and the efforts of the first settlers were directed toward clearing the land and growing crops for subsistence. Long before the region was settled by white men, the Indians had been farming lands in some parts of the county, growing corn, fruits, and vegetables. A large Indian settlement was located in the south-central part of the county, and a considerable area of the land of this section was in a more or less cleared condition and was being farmed.

The crops grown by the first settlers were corn, wheat, potatoes, flax, and vegetables, all of which were subsistence crops. Oxen were largely used for work stock, farm conditions were hard, and methods were slow and crude. Settlers came in rather fast after the beginning of the nineteenth century, and soon there was a surplus of farm products. This was hauled overland to the markets in the eastern part of the State.

Transportation by wagon and sled was slow and laborious hauling, and development of agriculture was delayed by the lack of a suitable outlet to markets, but with the completion of the Erie Canal in 1825 conditions in this respect were greatly improved and farming given further stimulus. Railroads were built in the early forties, giving communication to the East and West and opening new markets for the surplus products of the farms.

The following table, compiled from the reports of the Federal census from 1880 to 1920, shows some of the changes that have taken place in the agriculture of the county.

Number and size of farms, improved land, value of farm property, and assessed value of farm land, 1880 to 1920

Census year	Number of farms	Average size of farm	Improved land per farm	Value of all farm property per farm	Land, value per acre
		Acres	*Acres*	*Dollars*	*Dollars*
1880	5,569	77.0	64.3	5,696	----------
1890	5,011	80.0	69.1	5,453	----------
1900	5,039	82.1	67.9	4,499	25.99
1910	4,785	85.9	70.5	5,625	25.81
1920	4,297	92.2	72.5	9,260	36.65

The above table shows a decrease in the number of farms since 1880 with an increase in the size, both in total acreage and in the acreage of improved land. The value of farm property decreased during the first two decades, but has more than doubled in value in the last two decades. Land values have shown a steady increase and are increasing at the present time.

In 1880, according to the census, 83.9 per cent of the farms were operated by owners and 16.1 per cent by tenants; in 1899 the percentage was 71.2 by owners, 27.8 by tenants, and 1 per cent by managers; in 1919 the percentage was 76.7 by owners, 21.8 by tenants, and 1.5 by managers.

The acreage and production of the principal crops from 1879 to 1919, as reported by the Federal census, are given in the following table:

Acreage and production of principal crops in 1879, 1889, 1899, 1909, and 1919

Crop	1879		1889		1899		1909		1919	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	29,225	1,086,061	21,352	704,668	26,967	939,280	23,491	850,149	14,186	768,066
Oats	29,724	1,041,403	28,003	848,773	37,829	1,456,150	38,920	1,210,652	24,717	601,254
Wheat	45,055	692,028	31,147	564,246	37,266	730,240	16,388	364,018	27,850	557,302
Barley	23,516	576,813	35,249	934,543	13,307	396,140	10,691	300,512	11,713	260,318
Buckwheat	4,158	72,480	3,647	69,418	12,155	218,330	14,420	388,598	9,977	198,712
Beans	-------	14,078	-------	2,952	369	3,551	179	3,493	511	8,532
Potatoes	7,050	761,011	7,842	418,501	7,505	776,969	8,089	1,037,829	6,161	573,983
		Tons		*Tons*		*Tons*		*Tons*		*Tons*
Hay and forage	72,676	81,188	91,015	127,400	100,584	136,396	101,595	151,721	122,636	254,587
		Pounds		*Pounds*		*Pounds*		*Pounds*		*Pounds*
Tobacco	299	407,769	1,445	1,465,413	1,495	1,602,760	460	551,105	266	317,322
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples	-------	----------	292,605	217,997	331,535	463,644	252,458	484,341	200,829	233,481
Peaches	-------	----------	25,091	4,034	34,384	2,427	29,560	13,149	6,949	863
Pears	-------	----------	35,365	15,757	36,105	17,571	36,687	23,088	32,665	21,780
	Vines	*Pounds*	*Vines*	*Pounds*	*Vines*	*Pounds*	*Vines*	*Pounds*	*Vines*	*Pounds*
Grapes	-------	----------	-------	----------	131,240	1,017,700	56,113	661,826	14,379	248,014

A study of the foregoing table shows that the cereals in general have largely decreased in acreage since 1879, whereas hay and forage have increased, the gain being almost 69 per cent. The acreage in potatoes has been fairly constant for the years reported. Although the tobacco acreage rose considerably from 1879 to 1899 it decreased greatly in the next decade, and sank below the 1879 acreage in 1919.

General farming, consisting of the growing of corn, oats, wheat, buckwheat, and alfalfa, clover, and other hay crops, with special crops such as potatoes, cabbage, beans, some tobacco, considerable fruit, and some canning crops constitutes the agriculture of the county. Livestock, principally cattle and hogs, is raised to some extent. Dairying is an important industry and is carried on largely with general farming.

According to the 1920 census, of the cereal crops, wheat occupied the largest acreage, being grown on 27,850 acres in 1919, with a yield of 557,302 bushels, or an average of slightly over 20 bushels per acre; oats was next in acreage, being grown on 24,717 acres, with a yield of 601,254 bushels, or an average of 24.3 bushels per acre; corn was grown on 14,186 acres, yielding 768,066 bushels, an average of 54.1 bushels per acre; barley on 11,713 acres, yielding 260,318 bushels; and buckwheat on 9,977 acres, yielding 198,712 bushels.

About 55 per cent of the farm lands of the county are devoted to hay and forage crops and the area in these crops far exceeds the acreage of all other crops combined. The acreage given for hay and forage crops in the above table includes tame hay, wild hay,

grains cut green, silage crops, and coarse forage crops. Of the tame hay crops, timothy alone was grown on 32,951 acres, producing 48,094 tons of hay; timothy and clover mixed occupied 59,334 acres, yielding 83,180 tons; clover alone occupied 3,382 acres, yielding 5,561 tons; alfalfa was grown on 10,007 acres, yielding 21,720 tons; and other cultivated grasses on 1,741 acres, yielding 1,681 tons. Wild grasses were cut from 291 acres, yielding 268 tons; grains were cut green for hay from 259 acres, with a yield of 428 tons; silage crops occupied 8,283 acres, yielding 76,901 tons; and coarse forage occupied 6,299 acres, yielding 16,334 tons.

The hay and forage crop was valued at $4,551,982 in 1919 which exceeded the value of cereals by $451,920. A considerable proportion of the hay crop is fed on the farms to livestock, principally dairy cattle. The average yield of hay crops is slightly above 2 tons per acre. Some hay is baled and shipped out of the county. The acreage devoted to alfalfa is increasing very rapidly and the calcareous soils of the county are well adapted to this crop. Two and three cuttings are obtained, the combined yield ranging from 2 to 3 tons per acre.

Tobacco is grown in the vicinity of Cato and Meridian. Yields of 1,000 to 1,200 pounds per acre are obtained. The principal varieties are Connecticut Improved Havana and Wilson Improved. The tobacco is marketed principally in Baldwinsville, a town situated a few miles to the east in Onondaga County.

Corn is grown for silage and also for grain. The principal varieties grown for silage are Luce Favorite, Leaming, Sweepstakes, and Cornell No. 11, and the usual yield varies from 10 to 12 tons per acre. The principal varieties grown for grain are Yellow Flint and White Cap Dent, with Cornell No. 11 rapidly increasing in favor. The ordinary yield ranges from 35 to 40 bushels per acre. Corn is grown on practically all the well-drained soils of the county.

The principal varieties of oats grown are Silvermine, Jefferson County Banner, Swedish Select, and Welcome. The usual yield is about 25 to 30 bushels. Clover, alfalfa, or other grasses usually are sown with oats. The ground is plowed or disked in the spring and a good seed bed is prepared.

The greater part of the wheat grown is sown in the fall. Snow remains on the ground during much of the winter and protects it from winter killing and heaving. Wheat usually follows corn or some other intertilled crop. The principal varieties grown are Dawson Golden Chaff, Gold Coin, Cornell 507–8, and Leap Prolific. The average yield is slightly over 20 bushels per acre.

Barley and buckwheat are grown extensively in the county. The average yield is between 25 and 30 bushels per acre. Buckwheat does well on the better lands and also on some of the wetter and acid soils.

Some teasel is grown to the east of Auburn near the northern end of Skaneateles Lake. It is a two-year crop which is planted and cultivated similar to corn. The spines or tops of the plants are cut the second year and are used by manufacturers of worsted cloth for pulling the nap on the cloth. These heads, or spines, sell at $1.25 to $3 per 1,000, and the yields are from 150,000 to 200,000 heads per acre.

Considerable truck farming is done near Auburn and on the better drained Muck soils. Celery, lettuce, spinach, potatoes, and tomatoes are grown with good results. Onions produce good yields and constitute one of the principal crops grown on Muck. Some peas, beans, and a few other canning crops are grown near Auburn and Westbury.

Cabbage is grown extensively in the southern part of the county. The common varieties of early cabbage are Copenhagen and Burpee's Roundhead with Danish Ballhead as the late crop. The yields range from 10 to 12 tons per acre. Much of the cabbage is shipped out of the county to New York City and elsewhere.

Small white beans are being grown to some extent with good results.

Potatoes are grown extensively for home consumption, market, and certified seed. The principal varieties are Green Mountain, Sir Walter Raleigh, Dibbles Russet, No. 9, and Giant Russet. The average yield in 1919, according to the census, was approximately 128 bushels per acre.

Considerable fruit is grown in the county. The commercial orchards are mainly in the northern part near Lake Ontario. The principal varieties of apples are Baldwin, Rhode Island Greening, Black Gilliflower, Hubbardston, Northern Spy, and some Ben Davis. Bartlett pears are grown as well as plums and peaches. The orchards are well cared for, being properly cultivated and sprayed. The fruit is grown to supply home and local demands throughout the county. In 1919 there were 200,829 apple trees, 6,949 peach trees, 32,665 pear trees, 9,517 plum and prune trees, and 8,906 cherry trees reported by the census. In 1909, 56,113 grapevines were reported, which had decreased to 14,379 in 1919.

The total value of all farm crops in Cayuga County in 1919 was $11,295,089. Hay and forage crops and cereals contributed the greater part to this total. The county ranks eleventh in the State in the value of all farm crops.

In 1919, the value of all dairy products excluding home use of milk and cream, was $2,657,860. Dairying is carried on extensively in conjunction with general farming. Butter and cheese are made, but the greater part of the milk is shipped to New York City. The dairy stock consists of Holsteins, Guernseys, Jerseys, and some Ayrshires. In 1919 there were 35,736 head of cattle in the county of which 34,771 were classed as dairy cattle in the census report.

In 1919 there were 12,585 head of sheep in the county, valued at $163,012, and the value of the wool clip was $42,430. There were 19,720 head of hogs valued at $368,450. Most of the farmers raise enough hogs to supply home demands for meat. The value of all poultry in 1919 was $412,440 and the value of poultry products was $970,178.

The adaptability of the soils of the county to certain crops is realized to some extent by the better farmers. The soils derived largely from limestone material are recognized as the best soils for legumes and grain crops. Potatoes do well on many of the soils but do especially well on the looser soils and on the soils of the Lordstown and Wooster series. Hay crops do well on the heavier textured soils, and truck crops are grown almost exclusively on the fine sandy loam types and Muck.

The farming methods as a whole are good. The seed beds are well prepared and crops are cultivated thoroughly. All available manure is put on the soil and turned under. The more poorly drained spots in the cultivated fields are usually drained by tile or open ditches. The farm machinery is modern and includes tractors, hay balers, and ensilage cutters. The farmhouses and other buildings are kept generally in good repair and well painted.

Although there are no definite systems of crop rotation in general use, crops are rotated to a great extent by many of the farmers. Hay crops are usually cut for one to three years, followed by cultivated crops of corn, potatoes, cabbage, or beans for one to two years, and the land is then seeded to wheat or oats. Buckwheat is often sown in the spring when the ground remains too wet to be planted to corn. Hay crops are seeded with the grain crops.

The value of organic matter in the soils is realized, and all available animal manures and some green-manure crops are plowed under. Limestone dressings are applied to the soil, especially with legume crops. Phosphoric acid is applied to wheat, and mixed commercial fertilizers are used for cabbage and other truck crops. In 1919 the sum of $302,481 was expended for commercial fertilizers. The most common fertilizers used are 2–8–10 or 2–9–2 [1] mixtures, applied at the rate of 200 to 400 pounds per acre for the general farm crops. Larger applications of certain ingredients are used with special crops.

Farm work is done largely with horses, though tractors are used to some extent for plowing and preparing the seed beds. There were 14,421 horses and 304 mules in the county in 1920.

Farm labor has been rather scarce for the last few years and has commanded a high wage on account of the higher wages paid in the manufacturing centers. Wages range from $1.50 to $2.50 a day and from $30 to $50 a month. In 1919, 3,032 farms reported an expenditure of $1,248,917 for farm labor.

The 1920 census reports the average value of farm lands as $36.65 an acre. The better lands are held at $50 to $100 or more an acre, and some land can be bought for $10 to $20 an acre. The better lands of the Ontario and Honeoye soils are adapted to a much wider range of crop production and command a higher price than some of the other soil types. The small areas of very fine sandy loam soils and improved areas of Muck, as well as the orchard tracts, are held at relatively high prices. Buildings, equipment, and kind of soil are the factors governing land prices.

As a whole Cayuga County is considered one of the good agricultural counties of the State. A number of the soil types are in need of lime, drainage, and more organic matter. Many acres of productive land could be developed by proper drainage. Some of the soils are fairly high in lime but would be helped by additional applications; other soils are entirely lacking in lime. All manures and green crops should be plowed under to increase the content of organic matter. Deeper plowing and thorough preparation of the seed beds will materially increase crop yields.

[1] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

SOILS.[2]

The soils of Cayuga County are very variable in the color and texture of the surface materials, and in the structure of the subsoils. The texture of the soil material ranges from stony or gravelly loam or silt loam to silty clay. The finer soil particles are predominantly silt.

The soils have developed under forest cover, except in a few marsh areas. Where the drainage is fair to good the soils are light in color, and where the drainage is poor they are dark colored to nearly black. The soils developed under the best drainage conditions are brown to light brown in color, and the subsoils are yellowish brown, light brown, to slightly reddish brown. The soils developed under deficient drainage, but not marshy or swampy conditions, are grayish brown to gray, and the subsoils are either gray mottled throughout or yellow in the upper part and gray mottled below. Where the soils have developed under marshy or swampy conditions the surface soils are dark gray to black and the subsoils are mottled throughout the 3-foot soil section below the immediate surface layer.

The soils may be divided into three main groups on the basis of the color of the surface soil: (1) Brownish-gray to gray soils; (2) brown to dark-brown soils; and (3) soils that are dark gray to black. The second group is the most extensive in the county and includes the best farming lands from the standpoint of crop production. The third group includes soils that are high in organic matter. The first group is low in organic matter as a whole, as indicated by the light color of the soil.

The soils of the county may also be divided into three other groups according to the structure of the subsoil material: (1) Those having a loose and porous subsoil; (2) those having little or no compactness in the subsoil; and (3) those having a decidedly compact subsoil or hardpan. The first group includes the Groton and Chenango soils. The third group, with compact subsoils includes the Volusia, Westbury, Canfield, Chippewa, and Allis soils. The second group, which is the most extensive, includes the other soils mapped in the county.

The amount of lime present in the subsoil is important from an agricultural standpoint. In some of the principal soil series, the parent material from which the soil is derived is largely limestone. On the basis of effervescence with acid when tested in the field for lime carbonate, the unweathered parent materials may be divided into (1) those very rich in lime; (2) those moderately rich in lime, and (3) those poor or lacking in lime. The Honeoye series is in the first group; the Ontario, Cazenovia, Lyons, Groton, Farmington,

[2] The soils mapped in Cayuga County, do not join in all cases with the soils as mapped in Oswego County. This difference is because of a fuller understanding of the soils since Oswego County was mapped. During the progress of the soil mapping in Cayuga County, it became evident that the Ontario series, as its members had been previously mapped, should be divided into two series and the name retained for the group that contained a rather low percentage of limestone material. This allowed the extension of the series over soils with a moderate percentage of limestone material that under the older definition could not be included. Such soils in Oswego County were mapped as members of the Worth series, especially the Worth loam. A comparison of the soils along the boundary line between Cayuga and Oswego Counties shows Ontario loam on one side of the line and Worth loam on the other. The Worth loam in Oswego County, along the Cayuga County line, should be regarded in the future as Ontario loam.

Palmyra, Schoharie, and Poygan soils are in the second group, and the Lordstown, Volusia, Canfield, and Chippewa are representative of the third group.

In Cayuga County the underlying rock formations lie almost horizontal, with a slight dip to the south and southeast. During the Continental Ice Period all this region was covered with a sheet of ice of varying thickness. Much of the soil mantle as it occurs to-day represents débris which was carried by and pushed under the ice during the southward movement of the ice lobes. As the ice retreated to the north, material was dropped and some of it reworked by waters flowing from the melting glaciers. In many places these waters were held to the south of the ice front and formed lakes of various sizes and at different levels. Where the waters were held at a fixed level for a considerable time, lacustrine deposits of considerable thickness were formed. The depth or thickness of the glacial drift and the chemical and physical properties of the material are factors that determine to a large extent the character of the various soils mapped in Cayuga County.

The underlying geological formations outcrop only in a few areas. Medina and Oneida formations, principally of red sandstone and shale, occupy the northern part of the county but do not outcrop. The Clinton formation, consisting of shale and thin beds of limestone, occurs farther south, but no outcrops were observed. The Niagara formation, which occurs next, outcrops in a few places, but very little soil material has been formed in place from this rock. The Salina group of shale, gypsum, and salt beds underlies the north-central part of the area. A few outcrops of the Vernon red shales have been influential in the formation of the Lockport soils. The Onondaga limestone formation, which occupies a belt across the county passing through Auburn, outcrops or occurs near the surface in many places. The Farmington and Cazenovia soil series are influenced largely by residual material from this formation. South of Auburn the geological formations are principally shales belonging to the Genesee and Ithaca formations. A comparatively narrow strip of the Tully limestone occurs between these shales but outcrops only on the steeper slopes along Cayuga Lake.

The various underlying formations have had considerable influence in the formation of the soils. The Ontario soils are derived largely from material from the Niagara limestone formation, which was ground up and pushed along by the ice as it moved to the south. The Worth and associated series are derived largely from sandstones and shales of the Medina and Oneida formations. The Cazenovia, Farmington, Honeoye, and Lyons series are derived largely from material of the Niagara and Tully formations deposited as a mantle over the country to the south.

The limestones are less influential in the formation of the soils in the southern part of the area, more of the material composing these soils having come from the shales. The southern, and especially the southeastern part or hilly section, was not so much influenced by ice action or deposition as the country to the north, the mantle of till being thin and the soil material coming largely from the underlying shales. In the through valleys the quantity of till material in the form of moraines, kames, and eskers is greater.

The lake-laid material is found principally in the north-central part of the county, with some along Owasco Inlet and Salmon Creek. The largest areas of lake-laid materials occur in the vicinity of Auburn, Cayuga, Port Byron, Weedsport, and along the Seneca River, and an area in the northern part of the county near Fairhaven. The area near Westbury and Bethel Corners was influenced by the action of the waters of old Lake Iroquois, which stood at 450 to 460 feet above sea level. The soils of this section occupy lake plains, terraces, or beaches.

The soils of the county are formed largely from glacial material, derived mainly from near-by formations pushed along by the ice as it moved to the south, and reworked by waters flowing under the ice. Waters flowing from the melting ice and waters ponded south of the ice front, influence the deposition of stratified materials of terraces, benches, moraines, and lake beds. Water stood at various levels as the ice retreated, and soils derived from lake-laid materials are common from the 1,000-foot level down to the present level of Lake Ontario. Various agencies have been active in the formation of the soils, freezing, thawing, oxidation, drainage, leaching, and the growth and decay of plants all having an important part in bringing about the present conditions.

The soils of the area are divided into soil series on the basis of differences in general characteristics, such as color, structure, drainage conditions, and composition of parent material, and each series is divided into soil types on the basis of texture—that is, the proportion of stone, gravel, sand, silt, and clay in the surface soil. The type is the unit of soil mapping. In Cayuga County 27 soil series are represented by 35 types and 7 phases. In addition Muck, Marsh, Meadow, and Steep broken land are mapped.

On the basis of origin, mode of accumulation, and content of lime carbonate of the parent material the soils may be divided into nine broad groups: (1) Soils derived from glacial till, noncalcareous;[3] (2) soils derived from glacial till, calcareous; (3) soils derived from kames and eskers, calcareous; (4) soils derived from thin till and residual material, calcareous; (5) soils derived from thin till and residual material, noncalcareous; (6) soils derived from terrace and lake-laid materials; (7) first-bottom soils; (8) soils derived largely from accumulations of organic matter; and (9) miscellaneous soils.

Soils derived from glacial till, noncalcareous.—This group includes the soils of the Lordstown, Volusia, Wooster, Worth, Westbury, Canfield, and Chippewa series. The gravel and stone present are largely sandstone, shale, crystalline rocks, and occasionally limestone.

The types of the Lordstown series are characterized by light-brown or grayish-brown to yellowish-brown surface soils and a lighter brown to yellowish-brown subsoil, which has little or no compactness. The thin till is largely of shale and sandstone material which has not been transported very far. Bedrock of shale is reached within 3 feet of the surface in many places, and some of the soil material is derived directly from it. The series occupies gently

[3] Noncalcareous, as used in this report, means that the content of free carbonates is not sufficient to react visibly with cold hydrochloric acid.

rolling, sloping, to hilly land in the southeastern part of the county. Drainage is good to excessive. The Lordstown stony silt loam and steep phase of this type are mapped.

The Volusia series comprises types with grayish-brown to gray surface soils, and a mottled gray, yellow, and brown subsoil, the gray color becoming more pronounced with depth. The subsoil is heavy and compact and retards movement of soil water. The series is developed in swales in association with the Lordstown series. The topography is nearly level, and drainage is poor to deficient. The Volusia silt loam is mapped in this county.

The Wooster series includes types characterized by surface soils of brown to yellowish-brown color with a yellowish-brown to yellowish subsoil, which is little or no more compact than the surface soils. These soils occur in the southern part of the county along the slopes of the through valleys and the morainic uplands. Drainage is good. The Wooster gravelly silt loam and stony silt loam types are mapped.

The members of the Worth series are characterized by surface soils of brown to light-brown color overlying a light-brown to yellowish-brown subsoil, which is slightly more compact than the surface soils. The soil material is derived largely from red sandstone and shale. These soils occupy gently sloping to rolling topography or drumlins of the northern part of the area and are well drained. The Worth loam, with a poorly drained phase and a smooth phase, is mapped in this county.

The surface soil of the types included in the Westbury series are grayish brown to brownish gray to nearly black (swales or depressions) and the subsoil is yellow, gray, and brown mottled, and much more compact than the surface soil. The topography is flat and drainage is poor to deficient. One type, the Westbury stony loam, is mapped.

The surface soils of the types included in the Canfield series are brown to yellowish brown, underlain by a yellowish-brown to yellowish upper subsoil, which in turn is underlain by a mottled gray, yellow, and brown, compact lower subsoil. The upper subsoil resembles that of the Wooster soils and the lower subsoil that of the Volusia series. The types of this series represent an intermediate condition between the Wooster and Volusia soils. They are only fairly well drained. The topography is undulating and gently rolling to slightly morainic in places. The Canfield silt loam type is developed in this county.

The surface soils of the members of the Chippewa series are dark gray to nearly black, underlain by a gray or mottled gray, yellow, and brown, heavier and more compact material. The topography is flat or nearly level, these soils being developed in depressions or swales where drainage is poor to deficient. One type of this series, the Chippewa silty clay loam, is found in Cayuga County.

Soils derived from glacial till, calcareous.—This group of soils includes the Honeoye, Ontario, Lyons, Cazenovia, and Lansing series. The till material is largely from limestone, with some shale in the southern part of the county and along Cayuga and Owasco Lakes.

The surface soils of the types in the Honeoye series[4] are brown to slightly grayish brown when dry, and the subsoil is brown to light brown with a slight yellowish cast. The lower subsoil or substratum of partially weathered till is grayish in color. The subsoil of this series is slightly more compact than the surface soils, though it has a crumbly or nut structure when dry. The subsoil is highly calcareous at 15 inches and the lime content increases with depth. The series occupies ground moraines of gently rolling to undulating topography, with good drainage. The Honeoye silt loam, with a gravelly phase, is mapped.

The surface soils of the types grouped in the Ontario series are characteristically light brown to brown, underlain by a light-brown to yellowish-brown subsoil with grayish partly weathered till in the lower part of the 3-foot section. The subsoil has little or no compactness and is calcareous at 24 to 30 inches. The types are well drained. The soils of this series are closely related to the Honeoye series, and, although calcareous, do not effervesce as freely with acid or as near the surface as the Honeoye soils. This series is developed mainly in the drumlin region of the north-central part of the county, with some scattered areas through the southern part. The Ontario loam, with a steep phase and a smooth phase, and the silt loam, with a gravelly phase, were mapped in this area.

The Lyons types are characteristically grayish brown to dark brown in the surface soil, and yellow, gray, and brown mottled in the subsoil, which is more compact and heavier than the surface soil. The types of this series occupy swales or other areas lying lower than the Honeoye and Ontario soils, with which they are associated. Drainage is poor to fair, because of the smooth, flat to nearly level topography. Two types, the Lyons silt loam and silty clay loam, are mapped.

The surface soils of the types grouped in the Cazenovia series are brown to light brown, and the subsoil light brown to yellowish

[4] The Ontario series was established in New York many years ago to include light-colored soils that had been derived from glacial drift containing a considerable percentage of limestone fragments. This was the definition of the series when the soils of Yates, Monroe, Ontario, Jefferson, Wayne, Oneida, and Oswego Counties were surveyed. In the mapping of Cayuga, Tompkins, and Genesee Counties the soils of this series were more carefully studied than had been possible in the counties just mentioned mainly because these latter counties stretched entirely across the whole region of the State in which glacial drift containing limestone fragments is found, opportunity being thus offered for the comparison and study, within a short period of time, of all the members of the series as it had been previously defined. It was shown by this study that within the series as previously mapped there are two rather widely different groups of soils. One of these groups contains those types that have developed on the smoother topography and in which a compacted subsoil has formed. The smoother topography lies in the southern part of the general area in which these soils occur and in a region where the glacial drift from which they have been derived contains a higher percentage of limestone fragments than is present in the northern part. This group of soils, therefore, has a somewhat more compacted subsoil and also a higher percentage of limestone material than is true of the other group. It became evident, therefore, that these two groups should be separated. The southern group, the one with the greater percentage of limestone material in the subsoil and the somewhat compacted subsoil, is being named the Honeoye series, and the soils of the other group, those with a lower percentage of limestone material, with no compaction in the subsoil, and an occurrence on a rolling topography, retain the name of the original series, the Ontario.

The soils in Cayuga and Genesee Counties, therefore, that are now called Honeoye soils are identical with most of the soils in Monroe, Yates, and Oneida Counties which were mapped as members of the Ontario series. The soils mapped as members of the Ontario series in Cayuga and Genesee Counties are identical with most of the soils mapped as Ontario in Wayne County, the more rolling Ontario in Ontario County, most of the Ontario and some of the Worth soils mapped in Oswego County and a small part of the Ontario in Jefferson County. The limestone soils on the smooth lands of central New York belong in the Honeoye series, whereas those on the more rolling lands, and those with a relatively small percentage of limestone fragments, belong in the Ontario series.

brown and slightly more compact and heavier than the surface soils. The lower subsoil is closely related to the underlying Onondaga limestone formation. The bedrock outcrops in many places or at least lies within 3 feet of the surface. The topography is gently rolling to undulating and the drainage is good. The silt loam is the only type of this series developed in Cayuga County.

Soils derived from kames and eskers, calcareous.—The soils of this group are derived from kames and eskers formed mainly by waters under the ice during the glacial period. The Groton soil series represents this group in Cayuga County.

The surface soils of the types included in the Groton series are light brown or brown to yellowish brown, and underlain by a yellowish-brown to yellowish, loose, and porous material resting upon beds of stratified sand and gravel. The internal drainage is good to excessive. The surface is rolling to kamey, with potholes, and the slopes are comparatively steep. The stratified beds of gravel and sand are composed mainly of limestone material and the soils are calcareous. The Groton gravelly loam is mapped in this survey.

Soils derived from thin till and residual material, calcareous.—The soil material of this group represents a thin mantle of glacial till overlying a limestone formation, which has influenced the subsoil of the series. The Farmington series belongs to this group.

The Farmington series includes types with brown to ocherous-brown surface soils of mellow and friable structure. The subsoil is light brown to yellowish brown in color and little or no more compact than the surface soils. These soils are underlain by beds of unweathered limestone at variable depths, usually at 12 to 30 inches. The topography is gently rolling to sloping and slightly broken in places. Drainage is good. The Farmington silt loam type is mapped.

Soils derived from thin till and residual material, noncalcareous.—The soils of this group are derived from a thin mantle of till overlying material that is largely residual from the underlying red and gray shales. The Lockport and Allis series are included in this group.

The surface soils of the types in the Lockport series are light brown or reddish brown, and the subsoil is reddish brown to pinkish, with some yellow, green, or brown streaks. The mantle of till material is usually not more than 8 to 10 inches thick. The subsoil is heavier and more compact than the surface soil, and is largely residual from the underlying Vernon red shale. The drainage is good, though the compactness of the subsoil retards movement of soil water. The topography is gently rolling or undulating, and in places rather steep to broken. The Lockport silt loam is the only type of the series mapped in this county.

The Allis series comprises types with brownish-gray or yellowish-gray to gray soils, underlain by a yellowish-gray to gray and yellow, mottled, compact subsoil. The gray shale bedrock is encountered within 3 feet of the surface, in many places within 10 to 15 inches of the surface, and outcrops are common. Internal drainage is poor because of the compact nature of the subsoil. Surface waters run off rather quickly, as the topography is rolling to steep. The surface soil represents a thin mantle of till material, and the subsoil

is largely residual from gray shale. The Allis silty clay loam and stony silt loam types are found in Cayuga County.

Soils derived from terrace and lake-laid materials, calcareous.—The soils of this group are derived from materials that have been laid down by waters as terraces along stream courses and by lake waters. The gravel and stone of the Palmyra, Schoharie, and Poygan soils are largely limestone, and the unweathered materials are calcareous.

The surface soils of the types in the Palmyra series are brown to light brown in color, and underlain by a brown to light-brown, slightly more compact material. The substratum consists of stratified beds of sand and gravel extending many feet in depth. The topography is smooth to nearly level and slightly rolling in places. Drainage is largely internal and is good. The gravel is largely from limestone, though the soils do not effervesce very freely with acid and only in the lower part of the subsoil. The soil material is well oxidized. The Palmyra gravelly silt loam type is recognized in this survey.

The types of the Schoharie series are typically light brown, reddish brown to grayish brown in the surface layer, and reddish-brown to pinkish-colored compact and heavy clay to plastic clay in the subsoil. The lower part of the subsoil shows some streaks of gray or white lime spots, and the series is calcareous at 12 to 18 inches. Surface drainage is only fair, as the surface is smooth and gently sloping or almost flat. Internal drainage is poor on account of the compact nature of the subsoil. The Schoharie silty clay and silty clay loam types are mapped.

The Poygan series includes types with grayish-brown to nearly black surface soils, underlain by a mottled gray, yellow, and brown upper subsoil, and a reddish-brown to pinkish-colored lower subsoil. The lower subsoil is similar to that of the Schoharie series. This soil series differs from the Schoharie mainly in that it represents smooth, flat to nearly level swales occurring in association with the Schoharie soils, and drainage is poor to deficient. One type of this series, the silty clay loam, is mapped in the present survey.

The members of the Chenango, Alton, Dunkirk, Granby, and Tyler series are derived from material which is dominantly shale and sandstone. It is thus not so rich in lime as the parent material of the Palmyra, Schoharie, and Poygan series.

The surface soils of the types in the Chenango series are light brown to yellowish brown in color, and the subsoil yellowish brown to yellow and of comparatively open and loose structure. The soils occupy smooth, nearly level terrace lands. Drainage is internal and is good to excessive. The Chenango gravelly silt loam is the only member of the series developed in Cayuga County.

The surface soils of the types of the Alton series are brown or slightly reddish brown to coffee brown in color, and the subsoil is light brown to yellowish brown, friable, and loose. The soils occupy smooth, nearly level to slightly sloping terraces in the northern part of the county. Drainage is internal and is good. The Alton stony loam is mapped.

In the Dunkirk series belong types with light-brown, grayish-brown, or slightly yellowish-brown soils and a light-brown to yel-

lowish-brown subsoil. Drainage is generally good. The topography ranges from comparatively smooth, gently sloping and undulating to hummocky and slightly morainic. The Dunkirk silt loam and very fine sandy loam types are mapped.

The Granby series is characterized by dark-brown, dark-gray, to nearly black surface soils. The upper subsoil is mottled gray, yellow, and brown, and is more compact than the surface soils. The lower subsoil consists of stratified gray, yellow, and occasionally pinkish fine sand and clay. The types are smooth and nearly level; they occupy swales and depressions or lake-laid plains, and the drainage is not good as a whole. The Granby silty clay loam is mapped in the present survey.

The Tyler series includes types with light brownish-gray to dull-gray surface soils resting on a gray, yellow, and rusty-brown mottled subsoil. The subsoil is normally more compact than the surface soil, and the lower subsoil in many places consists of stratified beds of sand and clay. The types are smooth to very gently undulating and occupy old lake plains or terraces. Drainage is largely internal and is fair in the sandier soils and retarded in the heavier soils. The Tyler silt loam, silty clay loam, and very fine sandy loam types are mapped.

First-bottom soils.—The soils of this group represent first-bottom lands along streams which may be subject to overflow. The Genesee, Holly, and Papakating series are in this group.

The surface soils of the Genesee series are brown, with a brown to slightly lighter brown subsoil of about the same texture or a little more compact or heavier than the surface soils. The Genesee silt loam type, which was mapped in this area, occupies smooth to nearly level first-bottom lands subject to occasional overflows. Drainage for the most part is good.

The surface soil of the types in the Holly series is brown or grayish brown to slightly yellowish gray or gray in color. The subsoil is mottled gray, yellow, and brown, the gray color becoming more pronounced with depth. The subsoil is heavier than the surface soil. The types of this series occupy flat first-bottom lands along stream courses and are subject to overflow. Drainage is not as good as for the Genesee series and is poor as a whole. The soil material is mainly from shale and sandstone. The Holly silty clay loam is mapped in this county.

In the Papakating series the surface soils are dark brown to nearly black, and underlain by a brown subsoil, slightly mottled gray and yellow in the lower part. The subsoil is more compact and heavier than the surface soils. The types occupy flat to gently sloping first-bottom lands. Drainage is only fair to poor. The Papakating silty clay loam type is mapped.

Soils derived from the accumulation of organic matter.—The soil material of this group represents weathered to decayed vegetable

matter containing more or less mineral matter, and has a black color. Muck and Marsh constitute this group.

Muck consists of nearly black to black, well-decomposed vegetable matter, extending to a depth of 3 feet or more, without much change except that it may become more woody material in places. The Muck deposits of this county are deep. In its natural state it has poor drainage.

The soil of Marsh is typically the same as Muck, but is not so deep. The mucky layer has a depth of a few inches to 18 to 20 inches, where it is underlain by gray and bluish marl, carrying a large percentage of fine shells. This material is poorly drained in its natural state.

Miscellaneous soils.—This group includes Steep broken land and Meadow. Steep broken land includes land whose topography is too steep or broken for cultivation. Meadow consists of nearly black surface soils with mottled subsoils. It occupies swales and depressions where drainage is poor and remains wet or saturated much of the time.

The soil types mapped in Cayuga County are described in detail in subsequent pages of this report. The distribution of the soils is shown on the accompanying map. The following table gives the actual and relative extent of the different soil types:

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Ontario loam	66,560	18.9	Dunkirk very fine sandy loam	8,512	1.9
Smooth phase	11,328		Genesee silt loam	7,936	1.8
Steep phase	7,296		Schoharie silty clay	6,848	1.5
Honeoye silt loam	69,248	18.3	Marsh	6,720	1.5
Gravelly phase	12,864		Lyons silt loam	6,144	1.4
Granby silty clay loam	21,248	4.7	Alton stony loam	5,888	1.3
Cazenovia silt loam	19,904	4.4	Steep broken land	5,760	1.3
Muck	16,320	3.6	Schoharie silty clay loam	3,456	.8
Lyons silty clay loam	15,808	3.5	Westbury stony loam	3,136	.7
Palmyra gravelly silt loam	15,680	3.5	Meadow	3,136	.7
Ontario silt loam	13,248	3.4	Poygan silty clay loam	3,136	.7
Gravelly phase	1,728		Farmington silt loam	1,984	.4
Wooster gravelly silt loam	14,208	3.2	Lockport silt loam	1,920	.4
Canfield silt loam	13,248	3.0	Papakating silty clay loam	1,920	.4
Worth loam	8,192	2.9	Tyler silt loam	1,920	.4
Poorly drained phase	2,880		Allis stony silt loam	1,728	.4
Smooth phase	2,368		Tyler silty clay loam	1,600	.4
Lordstown stony silt loam	7,744	2.6	Holly silty clay loam	1,600	.4
Steep phase	3,840		Allis silty clay loam	1,472	.3
Volusia silt loam	11,200	2.5	Chippewa silty clay loam	960	.2
Groton gravelly loam	10,048	2.2	Tyler very fine sandy loam	832	.2
Lansing silt loam	9,856	2.2	Chenango gravelly silt loam	640	.1
Dunkirk silt loam	9,152	2.0			
Wooster stony silt loam	8,704	1.9	Total	449,920	

LORDSTOWN STONY SILT LOAM

The surface soil of the Lordstown stony silt loam to a depth of 5 to 6 inches is a light-brown or yellowish-brown to grayish-brown, mellow and friable silt loam, carrying a comparatively high content of stone and some gravel. The subsoil is a yellowish-brown to yellowish, slightly more compact silt loam. Locally the material at a depth of 2 feet or more contains slight mottlings of yellow and gray, and is rather compact in place, though friable when bored out. The

stone and gravel, which is scattered over the surface and through the soil mass, consists of angular shale fragments ranging in size from small gravel to stones 5 to 8 inches in largest diameter. Stone fences and stone piles are common on the cultivated areas, as the stones are so numerous in many places as to interfere with cultivation unless the largest are removed.

The soil is derived from a thin mantle of glacial till overlying shale and some sandstone, and much of the soil material really represents the weathering in place of the underlying shale, which in most places is encountered within 3 feet of the surface, and outcrops are common on the steeper slopes.

As a whole the soil and subsoil are loose and friable, with little or no mottling or compactness. In a few areas, where the surface is flat and drainage imperfect, the lower subsoil is slightly mottled. The fine earth part of the soil material is typically a mellow silt loam, though in a few places the surface soil is more gritty and has a loam texture. The quantity of stone present is variable and some small areas are practically stone free. East and northeast of Moravia the surface soil has a decided grayish-brown cast when dry, and the subsoil is also more grayish. In a few small areas occurring on seepy slopes the soil remains wet or saturated much of the time, causing more pronounced mottling. Such areas really are Volusia soil, but on account of their small size they are included with this type.

The Lordstown stony silt loam is confined almost entirely to the southeastern part of the county. It occupies gently sloping, rolling, to hilly country with some rather steep slopes. The largest areas lie between the southern end of Skaneateles Lake and Moravia. The type has an elevation of 1,200 to 1,800 feet above sea level.

The drainage of the type as a whole is good, except for the few small swales of Volusia material that have been included. On the steeper slopes surface waters run off rather quickly and erosion is more or less active. The soil shows no lime present within 3 feet of the surface, when tested with hydrochloric acid. Owing to the loose friable nature of the soil, it is not as retentive of moisture as some of the other soils of the county, though crops suffer for lack of moisture only during the driest years.

Originally all of this type was forested with a growth of sugar maple, chestnut, white pine, and hemlock. A large part of it is cleared and used for growing general farm crops, and a considerable area is used for pasture. Dairying is carried on in conjunction with general farming.

The principal crops are corn for silage, oats, buckwheat, potatoes, cabbage, and some timothy hay. Corn yields from 6 to 8 tons of silage per acre, oats 20 to 30 bushels, and buckwheat 20 to 30 bushels. Potatoes do well, yielding from 100 to 150 or more bushels per acre. Cabbage yields from 6 to 8 tons. Hay crops yield from 1 to 1½ tons per acre. A few apples are grown with fair yields and good quality of fruit. The orchards are all old and are given little care.

The Lordstown stony silt loam is deficient in organic matter, as indicated by the light color of the soil. Available manures are used, but as the supply is limited, the turning under of green cover crops should be more commonly practiced. The soil is slightly acid, and

applications of lime at the rate of 600 to 1,200 pounds per acre would prove beneficial, especially for growing legumes. Some of the farmers are applying lime with good results. A few use commercial fertilizers with cabbage and potatoes.

Land of this type ranges in price from $10 to $50 an acre.

Lordstown stony silt loam, steep phase.—The steep phase of the Lordstown stony silt loam occupies the steeper, rougher, and more broken slopes of the type, the main difference being in topography rather than in soil character.

The surface soil is a light-brown, yellowish-brown, to slightly grayish silt loam. The subsoil is a yellow to yellowish-brown silt loam. Angular and subangular shale fragments occur on the surface and throughout the soil section. The soil of this phase is very shallow, bedrock generally occurs at depths of less than 3 feet, and outcrops of shale and sandstone are common.

This phase occurs in close association with the typical soil in the southeastern part of the area, occupying the steeper slopes on the west side of Owasco Inlet, the steep slopes near Morse Mill and Dresserville, and near the Cortland County line. As a whole the phase is well to excessively drained.

Practically all the phase is forested with maple, ash, chestnut, hemlock, and butternut. Only a few small areas are cultivated as the slopes are too steep for practical farming. The phase is used for pasture lands and for forestry for which it is best adapted.

VOLUSIA SILT LOAM

The surface soil of Volusia silt loam has a depth of about 4 to 6 inches and consists of brownish-gray to gray heavy silt loam. In the forested areas the surface soil is more yellowish to yellowish brown. The upper subsoil to a depth of 15 to 18 inches is a gray to mottled gray, yellow, and brown, compact and heavy silty clay loam. The line of demarcation between the surface soil and the subsoil is distinct. The lower subsoil is a gray to drab, slightly mottled with yellow, rather compact and heavy silty clay, resting upon a substratum of partly weathered till and the underlying shale rock at variable depths. The soil material is usually saturated with water and the mottlings are quite conspicuous, but when dry the mottlings are less noticeable. The grayish cast of the surface soil is very pronounced in cultivated fields when dry. Many subangular and flat shale fragments are scattered over the surface and through the soil mass.

The soil contains a high percentage of silt and clay, with very little gritty material, and tends to bake and crack when dry. The compact subsoil is often referred to as "hardpan."

This type is formed by weathering of a thin mantle of glacial till material and the underlying shale rock. In many places the till is only a few inches thick. Outcrops of shale are common, especially on the slopes to the southeast of Moravia. Much of the type occupies seepy swales or depressions, and the water-logged condition is largely responsible for the mottled color of the subsoil. As a whole the type is deficient in drainage, owing to the impervious nature of the subsoil and seepage of surface waters.

This type is confined largely to the hilly section in the southeastern corner of the county, the largest areas occurring east and southeast of Moravia. Its total extent in the county is about 17.5 square miles. The type occupies the broad divides of gently sloping to rolling country, the swales or depressions in association with the Lordstown and Canfield soils, and slopes at the base of hills where seepage occurs. The topographic features include gentle slopes with little relief, and broad, flat-topped ridges.

The larger part of the type not forested is devoted to hay and pasture. The swales and lower lying seepy areas are used exclusively for pasture. Some scattering areas are kept as woodlots. Crops of hay are usually very light. Buckwheat produces fair yields on the better drained parts, but corn does not do very well.

This type is not nearly as productive as the associated soils of the Lordstown, Canfield, and Wooster series. It is not an important soil for the production of crops, and is considered the lowest in order of agricultural importance of the upland soils of the county. Plowing under manures and green cover crops, application of lime, and tile drainage would prove beneficial.

WOOSTER STONY SILT LOAM

The surface soil of the Wooster stony silt loam consists of 8 to 10 inches of light-brown to yellowish-brown silt loam carrying a high content of slightly rounded to angular gravel and stone, ranging up to 6 or more inches in diameter. The quantity of this coarse material is sufficient to interfere materially with cultivation in many places. Stone piles and stone fences built of material removed from the cultivated fields, are common on the type. The fine earth material has a grayish-brown cast in cultivated fields when dry; in the forested areas the surface soil beneath the thin layer of leaf mold is light yellowish brown. The subsoil to a depth of 30 to 36 inches is a lighter-brown to brownish-yellow slightly more compact but friable silt loam to loam, carrying considerable gravel and stone.

In a few small areas where the surface is nearly level the lower part of the subsoil is more compact and has slight mottlings of gray. Such areas approach the Canfield soils in character.

The finer soil material is a silt loam over most of the type, but some variations occur where the material is more nearly a loam and is more gritty. Such variations generally cover small areas and are included with the silt loam in mapping.

This type is extensive in the southeastern part of the county, to the south and east of Moravia. It occupies broad, gently rolling to undulating divides, and steeper and more rolling slopes. The topography of the areas occurring in the main valleys, between the terrace lands and the steeper hill land, is more rolling to morainic than on the areas occurring higher up on the slopes. The line of demarcation between this soil and the Lordstown soils on the higher slopes is arbitrarily placed. The Wooster soils are derived from deep till of sandstone and shale material, whereas the Lordstown series represents more shallow glacial till over shale. The natural drainage is good.

The larger part of the Wooster stony silt loam is under cultivation to crops similar to those grown on the gravelly silt loam type.

Yields are similar, but perhaps not quite as high on an average. The soil has only a moderate content of organic matter and is low in lime. Land of this type is held at $25 to $50 an acre.

WOOSTER GRAVELLY SILT LOAM

The surface soil of the Wooster gravelly silt loam consists of 8 to 10 inches of light-brown to yellowish-brown gravelly silt loam. It is friable and mellow in structure and easily tilled. The gravel is rather abundant in most places, is rounded, and varies from small fragments to 2 inches or more in diameter. The subsoil to a depth of 30 to 36 inches is a lighter-brown, brownish-yellow, to yellowish friable, gravelly silt loam slightly more compact than the surface soil. The gravel content normally increases with depth. The subsoil is open and loose in structure, but is fairly retentive of moisture. The subsoil rests upon unassorted grayish till material which is made up largely of sandstone and shale gravel and stones.

In places the lower subsoil is somewhat compact and contains slight mottlings of gray at 30 inches or more. Such variation occurs in close association with the Canfield soils or on the nearly level areas of the type. Although the finer soil material is typically a silt loam, there are some areas in which it is more gritty and more nearly a gravelly loam. An area of true gravelly loam along the headwaters of Bear Swamp is included with the type on account of its small size. Sharp quartz grains are present in the soil in places, but the predominating finer material is silty in texture. The gravel in the soil does not interfere with cultivation.

The Wooster gravelly silt loam is derived from a deep deposit of glacial till composed largely of sandstone and shale material. It is closely associated with the Lordstown soils in the southeastern part of the county. Usually it occupies the lower valleys and slopes, while the Lordstown soils lie on the higher ridges and hilltops. In a few places the depth of the till material is the deciding factor in separating this type from the Lordstown soils.

The type usually lies at an elevation of 900 to 1,600 feet above sea level. It occupies the smooth to rolling slopes along the major valleys and the morainic dump material in the valley proper. The topography ranges from smooth and undulating to rolling and morainic. The separation of this type from the Groton soils is arbitrary in many places, though the topography is not so kamey and no stratification of the material was observed in this type.

The type as a whole is devoid of lime carbonate, as the material from which the soil is derived is largely from sandstone and shale. Material from the substratum of a few borings effervesced very faintly with acid, but generally there was no effervescence of the material within 3 feet of the surface.

Surface drainage and internal drainage are good but not excessive. The type has a loose friable structure but is retentive of moisture so that crops rarely suffer for lack of moisture.

Originally all the type was forested, but at present the greater part is cleared and used in the production of general crops. Corn, oats, wheat, buckwheat, potatoes, cabbage, and other staple crops are grown. Yields of cultivated crops are good and yields of hay are

fairly high. Dairying is carried on extensively with general farming. Some fruit of good quality is grown.

Land of this type is held at $50 to $100 an acre. Farms located on this type show prosperity.

Since the soil is only fairly well supplied with organic matter, the productiveness can be increased by applying all available manure and plowing under an occasional green cover crop.

WORTH LOAM

The surface soil of the Worth loam is 6 to 8 inches deep, light brown to brown in color, with a grayish-brown cast when dry. The subsoil is light brown to yellowish brown, with some mottlings of gray and yellow in the lower part. In texture it is a more compact friable loam to silt loam, which is crumbly when dry. Some borings show more sandy material. The subsoil rests upon unassorted till material, mainly of gray and red sandstone. Where the red sandstone predominates the till has a reddish to pinkish cast, as observed in the deeper road cuts. Stone fragments are common on the surface and throughout the soil section, though not numerous enough to interfere seriously with cultivation. The stones have been removed from many fields and used to build fences or placed in piles.

The soil consists of glacial till material, mainly from red and gray sandstone and shale, with some from crystalline rocks and limestone. The soil does not show any lime carbonate within 3 feet of the surface, when tested with acid, but effervescence was noted in the substratum material taken from deep road cuts.

As a whole the type is well drained. The areas on the typical drumlins and more rounded slopes are better drained than some of the interdrumlin areas in which the drainage conditions range from poor to fair. Mottlings in the Worth soils are conspicuous only where the type approaches a poorly drained condition. The unassorted till material underlying the type is compact and hard in places and is locally called "hardpan."

The topography ranges from undulating to rolling and hilly. Much of the type occurs on ridges and hills or morainic land. It lies at an elevation of 250 to 400 feet above sea level, and is favorably situated for cultivation.

This type of soil is quite extensive in the vicinity of Fairhaven and Sterling. It occupies a belt from 6 to 10 miles wide across the northern part of the county, in association with the Dunkirk, Westbury, and Alton soils.

The greater part of the Worth loam is used in growing corn, oats, wheat, potatoes, and other general farm crops. Yields are fair to good. Dairying is carried on to a small extent in conjunction with general farming. Much of this type is used for growing fruit, principally apples and pears. Baldwin, Rhode Island Greening, Black Gilliflower, Hubbardston, Northern Spy, and Ben Davis are the principal varieties of apples. The climatic conditions south of Lake Ontario are particularly favorable for fruit growing and many small commercial orchards are located in this section of the county. Yields and quality of fruit are good. The type is favorably situated with reference to transportation and markets. Hay crops of timo-

thy and clover are grown quite extensively, and some alfalfa also is produced. A considerable part of the type is pasture land, and a small part is still in forest.

Crop rotations are followed to a small extent. A common rotation consists of hay crops for one to two years, followed by corn, potatoes, or beans, then small grain with grass seeded in the grain. Some commercial fertilizer is used and all available barnyard manure is applied to the land. Some lime is applied but liming should be more general in growing legumes. Deeper plowing, turning under of green-manure crops, and applications of lime will help to improve the productiveness of the type.

This soil type is productive of a variety of crops, and the farms have a prosperous appearance. Ordinary farm land sells for $50 to $100 an acre, and areas in orchard are held at a very much higher price.

Worth loam, smooth phase.—The surface soil of the Worth loam, smooth phase, consists of 8 to 10 inches of light-brown to brown loam, which in a few areas approaches a silt loam in texture. It has a grayish cast in cultivated fields when dry. The subsoil to a depth of 24 to 30 inches is a yellowish-brown to light-brown slightly more compact loam to silty loam, underlain by a slightly mottled yellow, gray, and brown loam, which is compact in place but crumbly and friable when bored out. The lower subsoil rests upon unassorted till material of gray and red sandstone and some crystalline rocks. In many of the lower lying areas the soil resembles the Dunkirk silt loam, with which it is closely associated. In a few small areas that are not well drained the subsoil is more mottled in color and more compact in structure.

This phase occupies the lower gently sloping to undulating and interdrumlin areas associated with the typical loam. It occurs around the base of the hills on the long smooth slopes. It is fairly extensive in the northern part of the county in the vicinity of Fairhaven and Sterling.

The soil material is similar to that of the typical loam in origin, with possibly some local modification due to lake influence. The soil is noncalcareous, according to the acid test, and the organic-matter content is only fairly high.

The larger part of this phase is devoted to general farm crops similar to those grown on the typical loam, and the yields are good. The topography of this phase is more favorable for cultivation than that of the typical soil. The soil can be improved by the methods suggested for the typical Worth loam.

Worth loam, poorly drained phase.—The surface soil of the Worth loam, poorly drained phase, consists of 8 to 10 inches of grayish-brown to brownish-gray, or gray when dry, compact loam to silt loam. The subsoil is a mottled gray, yellow, and rusty-brown compact loam to silt loam, extending to a depth of 24 to 36 inches. Below this lies the substratum of glacial till material derived from red and gray sandstone and some crystalline rocks. The compact nature of the subsoil and the mottled color indicate deficient drainage. Fragments of stone are common on the surface and throughout the soil section. The phase is deficient in organic matter, as indicated by the light color, and also is low in lime.

This phase occupies nearly level to gently sloping, smooth areas in association with the typical Worth loam in the northern part of the county. Drainage as a whole is deficient, as surface waters do not run off freely and the subsoil is compact and water-logged.

The Worth loam, poorly drained phase, occurs in a few small areas in the northern part of the county. Only a small proportion of it is used for farming, a few small areas being used for hay, grain, and corn. The yields are light. The greater part of it is used for pasture and for forest land. The soil is not considered suitable for farming in its present condition. Better drainage, the incorporation of vegetable matter in the soil, and applications of lime are suggested for its improvement.

WESTBURY STONY LOAM

The surface soil of the Westbury stony loam generally consists of 6 to 8 inches of grayish-brown to brownish-gray loam, but in places it is nearly black. The darker-colored soil occupies small swales or depressions, while the lighter-colored soil occupies the slight elevations or hummocks, and predominates over the type. The subsoil is a mottled gray, yellow, and brown, compact silt loam, which is underlain by unassorted glacial till material of gray and red sandstone and some crystalline rocks. Fragments of sandstone and crystalline rocks and bowlders are common on the surface and scattered through the soil.

The type occupies ridge crests or broad divides. It is nearly level and comparatively smooth as a whole, with numerous slight depressions and rises. Drainage is poor and water stands on the type for some time after rains. The soil material as a whole is low in organic matter and does not show the presence of lime when tested with hydrochloric acid.

This type of soil occurs in association with the Worth and Alton soils in the northern part of the county. The largest areas lie south of Sterling.

None of the type is used for the production of farm crops as it is too stony and poorly drained for practical farming. Some of it has been cleared and is used for pasture. The type supports a scrubby growth of trees and wild grasses. There is small prospect of its being developed as a farming soil.

CANFIELD SILT LOAM

The surface soil of the Canfield silt loam is typically a light-brown, brownish-gray to yellowish-brown mellow silt loam, 6 to 8 inches deep. The upper subsoil to a depth of 18 to 24 inches or more is a yellowish-brown to yellow silt loam only slightly if any more compact than the surface soil. The lower subsoil to a depth of 3 feet or more is a mottled gray, yellow, and brown very compact silt loam to gritty loam. The soil section rests upon a grayish-tinted unassorted till substratum, mainly of shale and sandstone. The upper part of the 3-foot section resembles the soil material of the Wooster soils, while the lower part is similar in compactness and mottlings to the Volusia soils. Considerable gravel and stone fragments occur on the surface and through the soil mass.

The type varies somewhat in texture, toward a loam on one hand and, in a few places, toward a heavy silt loam to silty clay on the other. The heavier textured areas occur along contacts with the Volusia soils. The type occurs in close association with the Wooster soils on one side and the Volusia soils on the other, and represents an intermediate condition between the two. In forested areas the surface soil is yellow and both it and the subsoil are loose in structure with only slight compactness at depths of 3 feet or more.

This soil represents the weathering of glacial till material, consisting mainly of shale and sandstone. The till deposits are several feet thick in most places, though in some places the underlying shale outcrops on the surface.

The topography is for the most part undulating to gently rolling, with some slightly morainic to ridgy areas. The topography is favorable for cultivation. Drainage is largely internal and is good to fair. In some of the smoother areas, where drainage is almost entirely internal, the drainage is not so good, owing to the compactness of the lower subsoil. The type is slightly more hummocky than the Volusia soils and drainage is better, though not as good as on the Wooster soils.

This type is confined largely to the hilly section in the southeastern part of the county. The largest areas lie southeast of Moravia and in the vicinity of Kelloggsville.

Originally all the type was forested, but at present the larger part has been cleared and is used for crop production or for pasture. Corn is grown for silage principally and fed mainly to dairy cows. Wheat and oats are grown to some extent; the yields are not very high. Buckwheat yields well. Timothy and clover mixed produce moderate yields of hay. Cabbage and potatoes are grown with fair success. The yields are higher than on the Volusia soils and compare favorably with those on the Wooster soils. A crop rotation is used to some extent on the type. It consists of hay for one or two years, then a cultivated crop, then a grain crop, and back to hay or grass. Some commercial fertilizer is used with grain crops. Land of this type sells for $20 to $50 an acre.

The Canfield silt loam is deficient in organic matter. None of it shows effervescence when tested for lime. As a whole the type is fairly well drained, though some local spots would be helped by artificial drainage. Deep plowing and turning under manures and green crops will increase the productiveness. Applications of lime would prove beneficial especially for the growing of leguminous crops.

CHIPPEWA SILTY CLAY LOAM

The surface soil of the Chippewa silty clay loam consists of 6 to 10 inches of dark-brown, dark-gray, to nearly black, heavy silty clay loam. The subsoil to a depth of 3 feet or more is a yellow, gray, and brown mottled to bluish-gray or drab, compact and impervious silty clay loam to silty clay. The gray or drab color becomes more pronounced with depth. The soil is practically free from gravel and stone, except a few fragments in the lower subsoil where the underlying shale comes within the 3-foot section. The substratum consists mainly of partly weathered grayish-colored stony till material,

FIG. 1.—EROSION ON THE ONTARIO LOAM, STEEP PHASE, ON THE DRUMLIN SLOPES NEAR VICTORY

FIG. 2.—TOBACCO GROWING ON ONTARIO LOAM, SMOOTH PHASE, ONE MILE NORTH OF CROSS LAKE

FIG. 1.—SWEET CLOVER GROWING ON THE HONEOYE SILT LOAM

Note the smooth gently sloping topography of the type. Legume crops do well

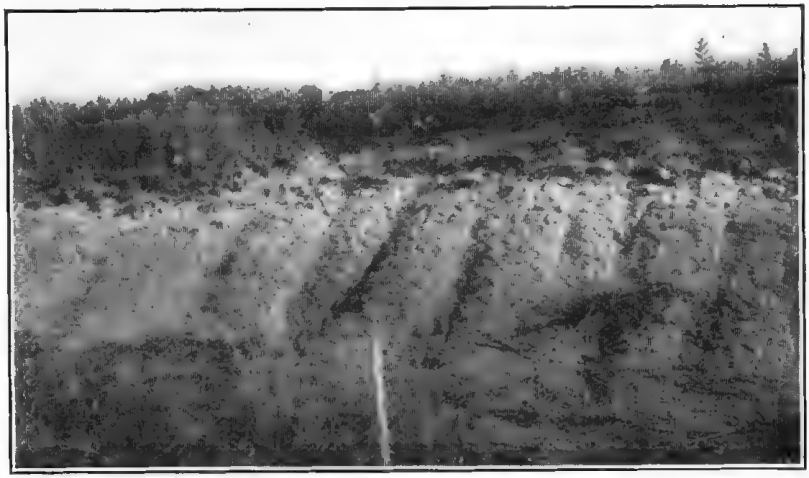


FIG. 2.—AN EXPOSURE OF THE VERNON RED SHALES ALONG THE NEW YORK CENTRAL RAILROAD NORTH OF PORT BYRON

The upper part is till material and the lower part is partially weathered shale, giving rise to the Lockport soils

derived principally from shale. In slight depressions the soil is nearly black and in some places it has a thin veneer of muck. This type is closely related to the Volusia soils, from which it differs mainly in the darker color of the surface soil.

The type occupies depressions or swales in association with the Canfield, Volusia, and Lordstown soils. The topography of the type is smooth and nearly level. Surface run-off is slow and internal drainage is deficient on account of the compact nature of the subsoil. The type has a moderate to high content of organic matter but is deficient in lime.

The Chippewa silty clay loam is mapped in a few small areas near Summer Hill, east of Moravia, and a small area southwest of Locke. Little of this type is farmed owing to its poor natural drainage. Most of it supports a growth of swamp grasses and scrubby trees. In its present condition it is used only for pasture land, to which it is best adapted. Adequate drainage is the first requisite in the improvement of this type.

ONTARIO LOAM

The surface soil of the Ontario loam is a light-brown to grayish-brown loam 8 to 12 inches deep. In a few places gravel is scattered over the surface and through the soil material. The upper subsoil is a light-brown to yellowish-brown loam, not much if any heavier than the surface soil, to a depth of 18 to 24 inches. The lower subsoil is a brownish-gray to gray or mottled yellow and gray loam, slightly more compact in places than the upper subsoil, but friable when bored out with the soil auger. It consists of partly weathered till material, principally of limestone and shale origin, and is calcareous, the abundance of lime increasing with depth. The type contains very little stone or gravel, except in a few places, and in these the content increases with depth. The limestone fragments consist of subangular pieces from one-half inch to 5 inches in diameter.

The Ontario loam is developed from deep unassorted glacial till, derived from limestone, shale, sandstone, quartzite, and some igneous rocks, which have been weathered and oxidized to a depth of 30 inches to more than 3 feet. The lower lying or more poorly drained soils of the Lyons and Granby series occupy the swales or depressions within areas of the typical Ontario loam.

As developed in Cayuga County, this type is comparatively uniform in color, texture, and structure. Southwest of Cato, near Conquest, and in a small area near Duck Lake along the Cayuga-Wayne County line, a variation occurs in that the soil in cultivated fields has a reddish-brown cast, and is slightly more compact and heavier than typical. Such areas represent soil material that is largely derived from the underlying shale, sandstone, or thin-bedded limestone. This variation of reddish-brown soil, occurring at the base of the steeper slopes of the drumlins, represents an approach to the Lockport soils, and where of sufficient extent has been mapped as the Lockport silt loam. To the north the Ontario loam grades into the Worth soils, and the boundary between it and the Worth soils is rather arbitrarily placed.

The Ontario loam is one of the most extensive soils in Cayuga County. It occupies a belt from 10 to 15 miles wide extending east

and west across the north-central part and includes the drumlin region of the county.

The drumlins are elongated ridges with a north-south trend, occurring singly or in series. The interdrumlin region is gently sloping to undulating. The ridges or hills are usually steep on the north-facing slopes and more gradual on the south, while the east and west sides have comparatively smooth gradual slopes. They range from one-fourth mile to more than a mile in length, and the crests rise from 100 to 200 or more feet above their bases. The general elevation of these drumlin hills above sea level is from 500 to 600 feet, and a few of the higher ones rise to slightly more than 600 feet.

The drainage of this type as a whole is good. There are comparatively few drainage courses. The surface run-off does not cause serious erosion except on the steeper cultivated slopes, as most of the rainfall penetrates the soil. A few interdrumlin areas included in the type are less well drained.

The Ontario loam is considered one of the best general farming soils of the area, and 90 to 95 per cent of it is under cultivation. The larger part of it is located in the north-central part of the county, which is traversed by several railroads and the State Barge Canal. Shipping conditions are therefore excellent.

The soil is fairly rich in organic matter, and has a rather high content of lime in the subsoil below 18 to 24 inches. Tillage is comparatively easy, and modern machinery is used for preparing the land and cultivating and harvesting the crops. As a whole the soil is retentive of moisture, but dries out so that it can be cultivated soon after rains.

General farming in connection with dairying constitutes the agricultural activities on this type. The principal crops consist of grasses for hay and pasturage, wheat, oats, corn, beans, cabbage, potatoes, tobacco, rye, buckwheat, some tree fruits, berries, and garden products. A few farms are exclusively dairy farms, but most of the dairying is carried on in conjunction with the growing of general farm crops. Some livestock is raised, principally dairy cattle, hogs, and horses.

A large part of the type is used for the production of hay crops, consisting of alfalfa, clover, timothy, and alsike. Permanent pastures are found only on the steeper slopes. Alfalfa is grown quite extensively and yields 1½ to 3 tons per acre from two or three cuttings. Clover and timothy mixed are grown with good results. Wheat and oats are the leading grain crops. Wheat is sown in the fall and harvested in June or July, and yields from 15 to 30 bushels per acre. Oats yield from 30 to 75 bushels per acre. White beans are grown extensively and yield from 10 to 18 bushels per acre. Cabbage yields from 8 to 20 tons, and potatoes from 75 to 175 bushels per acre. Tobacco is grown near Cato and Meridian and gives good yields. Corn is grown largely for silage feed for dairy cows and the yields are good. Apples and other fruits are grown with good success.

Crop rotation is practiced on the majority of the farms on this type, the most common rotation consisting of corn, beans, or

potatoes, followed by oats or wheat, and then seeded to grass, which remains for two to four years. All available stable manure is applied to the soil, and occasionally green crops are plowed under. Some commercial fertilizer is used with certain crops.

The Ontario loam is a productive soil adapted to a wide range of general farm crops, and conditions on the farms located on this soil indicate the prosperity of the farmers. The land sells for $50 to $125 an acre depending on improvements, location with regard to State roads, and nearness to markets.

Ontario loam, steep phase.—The soil material of the steep phase of the Ontario loam is similar in color, texture, and structure to the typical soil, except that the surface soil is not quite as deep on the phase. The main distinction is a topographic difference, the phase being steeply rolling to hilly. It occupies the steeper and rougher slopes of the drumlin hills, and on this account is not as desirable for farming as the typical soil.

Erosion is more active in cultivated fields on this phase than on the type (Pl. XXIV, fig. 1). The drainage is good to excessive, because the slopes promote a quick run-off of surface water.

The steep phase of the Ontario loam occupies isolated areas on the steeper slopes and hilltops of the drumlins in the north-central part of the county. A small part of it is farmed to general farm crops, principally hay and grain, while the larger part is devoted to pasture and forestry, for which it is best adapted. It is difficult to till on account of the steepness of the slopes. The small areas cultivated produce fair to good yields of grain, hay, and corn.

Ontario loam, smooth phase.—The surface soil of the smooth phase of the Ontario loam is a light-brown or grayish-brown to brown smooth loam to silt loam containing some partly rounded gravel in places. The upper subsoil is a lighter-brown to brown loam to silt loam, only slightly more compact than the surface soil. The lower subsoil is light brown to grayish brown, with some yellow or gray, and contains considerable gravel and partly weathered till material. The gravel and stone content is not high, and consists of limestone fragments, shale, and quartzite. The subsoil is calcareous at 24 to 30 inches as shown by the effervescence with acid. The soil is fairly high in organic matter. In color, texture, and structure this phase is similar to the typical soil, except that in a few places the material is more silty in texture.

This phase occupies interdrumlin areas of the north-central part of the county. The topography as a whole is smooth, gently rolling, to undulating. It occurs at the lower elevations and on low ridges in association with the drumlin ridges or hills. The principal areas are near Meridian, Conquest, and Cato.

Owing to its favorable topography, ease of tillage, and good moisture retention, this phase is very desirable for farming, and practically all of it is being used for the production of crops similar to those on the typical Ontario loam (Pl. XXIV, fig. 2). The same general farming methods are practiced on this phase as on the type, and the yields of the various crops are good. Land of this phase is valued about the same as the typical soil.

ONTARIO SILT LOAM

The surface soil of the Ontario silt loam consists of 8 to 10 inches of light-brown to slightly yellowish-brown silt loam, containing some fine gravel in places. The upper subsoil to a depth of 18 to 24 inches is a silt loam to loam slightly lighter in color than the surface soil. The lower subsoil is a grayish-brown slightly more compact loam which is crumbly when bored out with the soil auger. This is calcareous. The material from which the soil has been formed is derived from limestone, shale, and sandstone. The lower subsoil or substratum below 30 inches represents partly weathered till material, grayish in color and in places slightly compact.

This type is slightly lighter in color, brown to yellowish brown, than the typical Ontario soils, and in places the color resembles that of the Wooster soils. A few small areas are included in which the lower subsoil or substratum consists of slightly stratified gravel. While the texture of the surface soil is typically a silt loam, spots of loam texture occur throughout the type. Some gravel and slightly rounded stones are scattered over the surface in places.

The topography ranges from gently rolling and undulating to slightly morainic in places. The type occupies comparatively smooth, gently sloping ground moraine country in the south-central and southern parts of the county. It is a soil of moderate extent.

The same crops are grown on this type as on the loam, but not as much alfalfa. Yields of general farm crops are comparable to those on the loam type. The greater part of the type has been cleared and is under cultivation.

Ontario silt loam, gravelly phase.—The surface soil of the Ontario silt loam, gravelly phase, is a light-brown to brownish-gray silt loam to loam carrying considerable quantities of slightly rounded gravel of small to medium size. The upper subsoil, to a depth of 18 to 24 or 30 inches, is a lighter-brown to yellowish-brown gravelly loam, which is comparatively loose and porous. The lower part of the 3-foot section is a yellowish-brown or a yellow, brown, and gray. gravelly loam, the gravel content being quite high, and consisting of limestone, shale, quartzite, and some igneous material, slightly to well rounded, and often having a white coating of lime over the surface.

In a few places the soil contains considerable fine sand. In a few included small areas the subsoil is rather loose and porous, has a decidedly yellowish color, and resembles the Wooster subsoil. In spots the lower subsoil consists of stratified beds of gravel, resembling the same part of the profile in the Groton series. In a narrow strip along the lower slopes of Salmon Creek, near Venice Center, the lower subsoil consists of thin stratified beds of fine sand, silt, and clay, which represent lake-laid material, deposited in shallow water during glacial times, and the upper subsoil represents slope wash and till material deposited at a later time. A few patches too small to map, which occur as bars or ends of drumlins in the north-central part of the county, have stratified beds of gravel and sand in the lower subsoil.

The soil is fairly well supplied with humus. The lime content is comparatively high in the lower subsoil, though the surface soil and upper subsoil do not effervesce with acid.

The Ontario silt loam, gravelly phase, is not extensive in Cayuga County. It occupies comparatively small tracts, principally in the southern part of the area in association with the Ontario silt loam. It has a gently rolling, undulating, to slightly hilly topography and is well drained. Erosion is not active, as the soil absorbs the surface waters quickly and the run-off is slow.

General farm crops similar to those on the typical soil are produced. Less alfalfa and more buckwheat is grown. Grain, corn, potatoes, beans, alfalfa, buckwheat, and hay crops give good yields. Farming methods and practices are similar to those on the typical soil. The phase is not quite as productive as the typical soil, and the selling price of land is slightly less.

HONEOYE SILT LOAM

The surface soil of the Honeoye silt loam has a brown to dark-brown color, with a slightly grayish brown cast in cultivated fields when dry. It is a mellow and friable silt loam, 8 to 10 inches deep, containing some gravel and stone in places, but not enough to interfere with cultivation. The upper subsoil, to a depth of 18 to 24 inches, is a brown to slightly yellowish brown, friable and crumbly silt loam. The lower subsoil is a light-brown to slightly grayish brown, more gritty loam to silt loam. The substratum consists of unassorted till of a grayish color, mainly of limestone, with some sandstone and crystalline rock material. The substratum material is very deep over most of the type, and the parent limestone or shale is exposed in only a few places. Limestone fragments are abundant, however, in the lower part of the 3-foot section, and the soil is more highly calcareous than any other soil in the county.

The soil is derived from the weathering of glacial till material, representing ground moraine principally, and consists mainly of limestone with some shale and crystalline rock material. The larger part of the limestone is from the Onondaga limestone formation which underlies the county, passing through Auburn. During the glacial period much of the limestone was pushed to the south and spread over the country as a till deposit. The Tully limestone formation, which outcrops in places to the south, also gave rise to some of the material. The Honeoye soils are derived largely from this material and are highly calcareous. In passing from Auburn to the south the soil effervesces freely as far south as King Ferry and Genoa, and from there southward the degree of effervescence gradually diminishes and occurs lower down in the soil section. The soils along the south boundary derived more largely from shale with some limestone and only calcareous in the lower part of the subsoil are classed in the Lansing series.

In the vicinity of Aurora there is a variation of the Honeoye silt loam in which the subsoil is more compact and heavier than typical. The subsoil in places shows considerable lake-laid material consisting of thin bands or layers of pinkish-colored clay. Such variations are local and of small extent and were included with the type. About 3 miles to the southeast of Aurora is a small area in which the surface soil carries considerable rounded gravel and the surface has the appearance of an old beach.

The surface soil is typically a silt loam, though there are some spots where the material is slightly more gritty. In a few small depressionlike areas in the type the lower subsoil is mottled like that of the Lyons soils. As a whole the type is very nearly uniform in texture and color.

The surface soil is mellow and friable and easily tilled. The subsoil material is crumbly and has a nut structure in a dry condition, but is not loose and open, and is retentive of soil moisture as well as favorable for capillary action. Internal drainage is good and surface waters drain off quickly.

The Honeoye silt loam is mapped in large areas on both sides of Owasco Lake south and east of Auburn. It is one of the more extensive soils of the county.

The topography is uniformly gently rolling to undulating. The slopes gradually become steeper with the approach toward Cayuga or Owasco Lake. All the type is favorable in topography for intensive cultivation.

This type is the most productive soil for general farm crops in the county. It is easy to till and has a comparatively high content of organic matter. Drainage is good, and crops do not suffer for lack of moisture during the growing season.

The general farm crops include corn, wheat, oats, buckwheat, some barley and rye, potatoes, cabbage, and hay crops of timothy, clover, sweet clover, and alfalfa (Pl. XXV, fig. 1). Corn yields 30 to 40 bushels of grain or 8 to 10 tons of silage per acre, oats from 30 to 50 bushels, wheat from 18 to 25 bushels, buckwheat from 20 to 35 bushels, potatoes from 60 to 100 bushels or more, and cabbage from 8 to 12 tons. Hay and legume crops do well, alfalfa yielding from 2½ to 3 tons per acre. Some dairying is carried on in conjunction with general farming. Considerable fruit, principally apples, is grown, with good yields of good quality. Vegetables are grown to supply home needs. The yields are slightly higher on this type of soil than on most of the other soil types of the county.

A common crop rotation consists of hay crops, mainly alfalfa or clover, for two or three years, followed by cultivated crops of corn, potatoes, or cabbage, for one or two years, then grain crops with which hay crops are seeded. All available manure is plowed under, and the turning under of green crops is also practiced. Commercial fertilizers are used with grain crops and some with corn. Lime is used for alfalfa and the alfalfa seed is inoculated.

The buildings and equipment on the farms indicate a high degree of prosperity. Land of this type is held at $75 to $125 an acre.

Honeoye silt loam, gravelly phase.—The surface soil of the Honeoye silt loam, gravelly phase, consists of 8 to 12 inches of brown to dark-brown, or slightly grayish brown when dry, mellow and friable silt loam, containing considerable subangular gravel and some stones on the surface and in the soil. The upper subsoil, to a depth of 18 to 24 inches, is a brown to slightly yellowish brown friable and crumbly silt loam to gravelly silt loam, only slightly more compact than the surface soil. The lower subsoil is a lighter-brown to grayish gritty silt loam, more crumbly, friable, and loose than the upper subsoil. The substratum represents partly weathered till material, mainly of limestone, with some shale, sandstone, and crystalline

rock. Limestone fragments are scattered throughout the soil mass and the gravel and stone content of the phase mainly distinguishes it from the typical silt loam. The lower subsoil or substratum is highly calcareous and effervesces freely below 18 to 24 inches.

The area mapped as this phase in the vicinity of Oakwood is more compact in the subsoil resembling the Cazenovia soils, and in some places is closely associated with the underlying Onondaga limestone formation, which outcrops in places. The area mapped along Salmon Creek near Genoa contains more shale rock fragments and the soil is not nearly so high in lime as is typical of the Honeoye series. This area represents a gradation from the highly calcareous Honeoye soils to the less calcareous soils of the Lansing series.

The soil material is similar in origin to the material of the silt loam type, being derived from limestone till mainly of the Onondaga limestone formation, with some from the Tully formation.

This gravelly phase of the Honeoye silt loam occurs in association with the typical silt loam. The principal areas lie near Oakwood, and along Salmon Creek near Venice Center. Other areas are scattered throughout the south-central part of the county.

The topography of the phase is similar to that of the typical silt loam, with perhaps slightly steeper slopes along Salmon Creek. The surface is favorable for intensive cultivation. The soil is well drained and is retentive of moisture.

This phase has about the same agricultural value as the typical silt loam, as the gravel content does not interfere to any extent with cultivation or with crop growth. The same general crops and farming methods are practiced and the yields are about the same. Land of this phase is highly prized for farming, as it is easily tilled and very productive.

LANSING SILT LOAM

The surface soil of the Lansing silt loam, to a depth of 8 to 10 inches, is predominantly a brown or dark-brown to slightly grayish-brown friable and mellow silt loam. The upper subsoil, to a depth of 24 to 30 inches, is lighter brown to slightly yellowish brown and more compact, but is crumbly and granular when bored out. The lower subsoil, which extends to a depth of 3 feet or more, is a lighter-brown to grayish, less compact, and more gritty loam to silt loam, which rests upon unassorted till material. Gravel and stone are scattered over the surface soil and throughout the soil mass to a depth of 3 feet. Flat shale fragments are present on the surface on the steeper slopes, and stone piles and fences, made of stones removed from the fields, are common.

The Lansing silt loam has been formed by the weathering of glacial till, principally shale material, with a little limestone. This till deposit varies in thickness but on the whole it is comparatively thin. On the smoother areas it is deepest, and on the steeper slopes the shale in many places lies very near the surface or outcrops, the till in such positions having been largely removed by erosion.

While this soil is typically a silt loam carrying flat shale fragments, there are a few areas where the material is more nearly a loam and others where the gravel and stone content is high enough to make it a stony or gravelly silt loam to loam. The change from

the mellow and friable surface soil to the more compact upper subsoil is very distinct in most places. The grayish-colored partly weathered till material, which is usually reached at 24 to 30 inches is calcareous, though it does not effervesce with hydrochloric acid as freely as the Honeoye soils to the north.

In some places along the steeper slopes of Cayuga Lake near Aurora and to the south, and along the slopes of Owasco Lake, the underlying shales and limestones are present in the 3-foot soil section, and the glacial till material is not more than 18 to 30 inches deep. In such places the lower subsoil is a more compact, mottled yellow and gray silty clay with a greasy or smooth feel resembling the Allis subsoil. This variation represents largely a thin mantle of Honeoye soil over partly residual material. Because of the steep slope, these areas are well to excessively drained, and not retentive of moisture. They are best suited for pasture lands and forestry.

The topography of the type varies from smooth, undulating, and gently rolling to comparatively steep. The slopes along Salmon Creek, Cayuga Lake, and Owasco Inlet are much steeper than those of the areas at some distance from the streams. The type occurs at an elevation of 900 to 1,100 feet above sea level. Surface drainage is good as a whole. On the flatter areas drainage is deficient, owing to the compactness of the subsoil. Such areas would be improved by tile drainage.

The Lansing silt loam is mapped in the southern part of the county, mainly along the Tompkins County line and Owasco Inlet. It covers a total area of 15.4 square miles.

The soil is fairly well supplied with organic matter as evidenced by the brown to dark-brown color. In the forested areas the surface soil is slightly lighter to yellowish in color. All of the type was originally forested, but practically all of it has been cleared, except some of the steeper slopes, which are not suited for farming.

Corn, oats, wheat, buckwheat, potatoes, cabbage, clover, and alfalfa constitute the principal crops. Legume crops do well, but applications of lime would no doubt prove profitable. Hay crops produce from 1½ to 2¼ tons per acre. Corn is largely cut for silage, yielding from 10 to 12 tons per acre. Small-grain crops do fairly well. Cabbage produces from 6 to 10 tons, and potatoes from 50 to 100 bushels per acre. Crops are rotated by most of the farmers. Hay crops are grown for two to three years, followed by cultivated crops of corn, potatoes, or cabbage for one to two years, and then by grain in which grass is seeded. All available manures are used upon the soil. Commercial fertilizers are used with grain crops.

Deep plowing, incorporation of vegetable matter, and applications of lime will improve the physical condition of the soil and increase its productivity. Land of this type is held at $40 to $75 or more an acre.

LYONS SILT LOAM

The surface soil of the Lyons silt loam consists of 8 to 12 inches of dark grayish-brown to brown silt loam, mellow and friable, as a rule, though in some places rather heavy. The upper subsoil is a yellowish-brown to mottled yellow, gray, and brown, more

compact and heavy silt loam. The lower subsoil, below 24 to 30 inches, represents partly weathered glacial till material, having a conspicuous grayish cast with some mottlings of yellow and brown. This is compact in place, but friable when bored out, and has a crumbly structure. Glacial gravel and stones, mainly of limestone, are abundant in the lower part of the 3-foot section, and the lower subsoil is calcareous.

Some gravel and stones occur on the surface and through the soil mass in places, but as a rule the type is comparatively free of such material, and it is nowhere present in sufficient quantity to interfere with cultivation. In places, especially in the virgin soil, the immediate surface soil for an inch or two in depth is dark colored to nearly black, such coloration being caused by decayed vegetable matter. As a whole the color of the surface soil of this type is slightly darker than the color of the associated Honeoye and Ontario soils, owing to the favorable position of this type for the accumulation of vegetable matter. A few small areas of silty clay loam are included.

The Lyons silt loam is not very extensive in this county. It occupies a number of small areas in the southern part of the county south of Auburn. It occurs mainly in comparatively narrow strips, occupying swales, depressions, and lower lying flats in association with the Honeoye and Ontario soils. The drainage is fair to poor, as the topography is not favorable for rapid run-off of surface waters, and the internal drainage is retarded by the compact subsoil.

The type is developed upon glacial material derived largely from limestone. The lower subsoil is calcareous. The soil material is similar in origin to that of the Honeoye and Ontario soils, but the material is not so well oxidized and is higher in organic matter.

A large part of the type is used for general farm crops, including corn, oats, hay, some cabbage, and considerable buckwheat. The better-drained parts produce good yields of corn, oats, and hay crops, but not quite as high yields as on the associated Honeoye and Ontario soils. The type is well adapted to buckwheat and yields of 20 to 30 bushels per acre are common. A small part of the type is in forest and used for pasture. Considerable dairying is carried on in this section of the county and some of this soil is used for pasturing dairy cows.

This soil can not be plowed as early in the spring as the higher-lying soils of the Honeoye series, as it remains wet later in the spring. Proper drainage by a system of small open ditches or tiles would materially benefit this soil. It is usually farmed in conjunction with the better-drained soils; very few if any farms are composed entirely of the Lyons silt loam.

LYONS SILTY CLAY LOAM

The soil material of the Lyons silty clay loam is similar in many ways to the Lyons silt loam, the main difference being the slightly heavier texture of the material and the slightly poorer drainage of the type as a whole.

The surface soil, to a depth of 8 to 12 inches, is generally dark brown or dark grayish brown, but is almost black in some of the more poorly drained positions. The texture is a heavy silt loam to

silty clay loam, less friable than the silt loam type. The upper subsoil, to a depth of 24 to 30 inches, is a yellowish-brown to mottled yellow, gray, and rusty-brown, more compact silt loam to silty clay loam. In a few places the material is gray to drab in color. The lower subsoil represents partly weathered grayish till consisting largely of limestone gravel and stones, and is calcareous. In a few spots the surface soil is nearly black muck material consisting of decayed vegetable matter. The area mapped to the east and southeast of Venice Center has a silt loam surface soil, underlain by stratified beds of silt and fine sand.

The topography of this type is similar to that of the silt loam. Generally it occupies the lower swales or depressions and the drainage is not good on account of the heavy nature of the subsoil.

The Lyons silty clay loam is extensive in the southern part of the county, where it occurs in association with the Lyons silt loam and the Honeoye and Ontario soils. Only a small part of it is under cultivation as it is poorly drained and too wet for crop production. The cultivated areas produce crops similar to those grown on the silt loam. The greater part of the type is used for pasture and for forestry, to which purposes it is best adapted in its natural state. It is in need of drainage by open ditches or tile.

CAZENOVIA SILT LOAM

The surface soil of the Cazenovia silt loam is a light-brown to grayish-brown mellow silt loam, 8 to 10 inches deep. The upper subsoil, to a depth of 24 to 30 inches, is a brown or reddish-brown to slightly pinkish colored silty clay loam to silty clay, which is compact in place, but is crumbly and friable when bored out with the soil auger. The lower subsoil is a light-brown or grayish-brown to gray compact silt loam to silty clay loam, and represents partly weathered glacial till material and residual material from the underlying Onondaga limestone formation which comes near the surface or outcrops in places. The subsoil is decidedly compact in place, but crumbly and friable when bored out.

A few spots of loam, as well as a few spots of silty clay loam, are included in the type. The soil is practically free from gravel or stones, at least in quantities that would interfere with cultivation. In the vicinity of Half Acre the subsoil material in small level spots is largely influenced by lake-laid clays of a reddish to pinkish color, and thin beds of lake-laid clays are encountered in the lower subsoil of this type elsewhere, but their occurrence is local.

The Cazenovia silt loam occupies a belt from 1 to 3 miles wide across the central part of the county. Its total area in the county is 31 square miles. It occurs in close association with the underlying Onondaga limestone formation and is derived from glacial till material, largely of limestone. The underlying rocks of the Onondaga formation are often encountered within 3 feet of the surface and a few outcrops were observed. The lower subsoil has a fairly high content of lime carbonate. The topography is sloping, gently rolling, or undulating. Drainage for the type as a whole is good, and surface waters run off quickly. The type is retentive of soil moisture and crops do not suffer for moisture during the growing season.

Originally all the Cazenovia silt loam was forested; now practically all of it is in cultivation. General farm crops, corn, oats, wheat, timothy, clover, alfalfa, potatoes, cabbage, and fruit are grown. Considerable dairying is carried on. Corn is grown both for grain and for ensilage, and yields well. Yields of grain crops are good. Hay produces from 1½ to 2½ tons per acre. The type is well adapted to clover and alfalfa. Potatoes yield 75 to 125 bushels and cabbage 8 to 12 tons per acre. Apples do well, though there are no large commercial orchards. Yields on this type are similar to those of crops grown on the Honeoye and Ontario soils.

This soil is fairly well supplied with organic matter. All available manure is put on the land and turned under. Crop rotation is practiced by nearly all farmers, consisting of clover or alfalfa followed by hay for two to three years, corn, potatoes, or cabbage, then grain crops, and then back to hay land. Commercial fertilizers are used to some extent with grain crops.

The soil is easily tilled and in a high state of cultivation. It is well located with reference to transportation and markets and farmers are prosperous, as evidenced by buildings and equipment on the farms. Land is held at $60 to $100 an acre.

GROTON GRAVELLY LOAM

The surface soil of the Groton gravelly loam consists of 8 to 10 inches of brown or light-brown to yellowish-brown friable and mellow gravelly loam, relatively high in sand and fine sand in some places. The upper subsoil to a depth of 20 to 30 inches is a lighter-brown, brownish-yellow, to slightly grayish, loose and porous gravelly loam, which is underlain by stratified beds of sand and rounded gravel. The soil material to a depth of 3 feet or more is loose and porous, with little or no compactness. The gravel content is very high on the surface and throughout the soil mass. The substratum of sand and gravel extends to several feet below the surface.

Although the soil is typically a loam in texture, small areas occur in the type where the material is more sandy, being a sandy to fine sandy loam. Only a few small scattering areas of this character were found. If of greater extent they would have been mapped as the Groton gravelly sandy loam.

This soil represents water-deposited material consisting of stratified beds of sand and gravel, largely of limestone, with some shale and crystalline rocks. It occurs as kames, eskers, and rough outwash areas.

The topography of the Groton gravelly loam ranges from rolling and morainic to kamey, with potholes or kettles. For the most part the surface is rolling, with comparatively steep slopes, but the slope is rarely too steep for cultivation. Drainage is largely internal. Owing to the loose open nature of the soil the type is not retentive of moisture and is inclined to be droughty, and crops often suffer for lack of moisture during the growing season.

The type occupies comparatively small scattered areas along Owasco Inlet and Salmon Creek and near Sennett, Port Byron, and Auburn, with small scattered areas throughout the north-central part of the county. In the southern part of the county the type

occurs mainly as narrow strips on the lower slopes of the through valleys. The area near Lake Como is kamey in topography.

Originally all the type was forested, but the larger part of it has been cleared and is under cultivation to corn, hay, grain, potatoes, cabbage, and other vegetables. Corn produces fair yields and is cut for silage. Grain crops do not produce very good yields. Potatoes, cabbage, and vegetables do well. Yields of hay crops are comparatively light.

The soil of this type has only a moderate content of organic matter. Applications of manure and turning under of green-manure crops will help build up the soil and increase its water-holding capacity. Although the type is calcareous in the lower subsoil, applications of lime would prove beneficial, especially with leguminous crops. This soil is well suited to vegetable crops, fruits, and berries.

Land of this type is held at $40 to $75 an acre.

FARMINGTON SILT LOAM

The surface soil of the Farmington silt loam to a depth of 6 to 8 inches is a brown, coffee-brown or ocherous-brown, mellow and friable silt loam, with variation toward a loam in a few places. On the steeper slopes and breaks of slopes the surface soil rests upon limestone rock. Where the soil is deeper the subsoil is a light-brown to yellowish-brown mellow and friable silt loam, little if any heavier or more compact than the surface soil. The soil material represents a thin covering of glaciated till material over residual material from the underlying limestone, which lies at 15 to 20 inches below the surface in most places. Fragments of the country rock are numerous on the surface and through the soil mass, and stone fences and stone piles are common.

This soil type is not extensive, occurring in comparatively small areas scattered over the central part of the county, in a belt passing from the county boundary east of Sennett through Auburn and Half Acre to Union Springs.

The topography ranges from gently sloping to slightly broken, with steep slopes in a few places. Drainage is internal, and is good to excessive.

Where the bedrock is near the surface the soil is droughty and crops suffer for moisture during the drier part of the summer. The soil is fairly high in organic matter and shows the presence of lime in the subsoil when tested with acid.

General farm crops consisting of corn, oats, wheat, alfalfa, and timothy are grown, with fair to good yields, but not quite as high as on the Ontario and Honeoye soils. Potatoes and cabbage also are grown with good yields. Dairying is carried on in conjunction with general farming. Very few farms are located entirely on this type of soil.

LOCKPORT SILT LOAM

The surface soil of the Lockport silt loam is a light-brown to reddish-brown, or grayish-brown when dry, smooth, loose, and friable silt loam, 6 to 10 inches deep. The subsoil is a reddish-brown to pinkish compact silt loam, showing some streaks of green and

rusty brown in the lower part of the 3-foot section. In many places at 24 to 30 inches the subsoil is a heavy silt loam to stiff clay. Small shale fragments occur on the surface and throughout the soil section, but very few large stones are present. The underlying red and gray shale is often reached in the 3-foot section, especially on the steeper slopes and at the base of some of the drumlins. The areas of Ontario loam described as having a reddish tinge really represent soil of the Lockport series, but were included with the Ontario loam on account of their small size.

The soil material represents a thin mantle or veneer of till deposited over the red and gray shale of the Vernon formation. (Pl. XXV, fig. 2.) On the slopes the residual material is on or near the surface.

The Lockport silt loam is not extensive in Cayuga County. Much of it lies north of Port Byron along the New York Central Railroad. A small area occurs east of Port Byron, another lies south of the Rochester & Syracuse Electric Railroad near the east side of the county, and a few other small areas are found in this section of the county.

The type occupies gently rolling, undulating, and hilly to broken slopes and areas at the base of the drumlins. The area northeast of Port Byron is gently rolling to undulating.

The areas of more favorable topography are under cultivation. General farm crops are raised, including corn, wheat, oats, timothy, alfalfa, and potatoes. Some fruit is also grown. Hay crops yield from 1 to 1½ tons per acre, wheat from 12 to 15 bushels, oats from 20 to 40 bushels, and potatoes from 50 to 100 bushels.

Yields on this type are not as good as on the Ontario soils. The soil is more compact, heavier in the subsoil, and less easily tilled than the Ontario soils. Internal drainage is not very good on account of the compact nature of the subsoil. The soil is deficient in organic matter. Application of manure, turning under of green crops, and the use of lime as well as deeper plowing, will no doubt prove beneficial.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lockport silt loam:

Mechanical analyses of Lockport silt loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
163136	Soil, 0 to 10 inches	2.4	3.4	1.2	4.8	10.6	55.7	21.9
163137	Subsoil, 10 to 36 inches	5.2	5.2	1.2	4.6	9.9	43.4	30.5

ALLIS STONY SILT LOAM

The surface soil of the Allis stony silt loam consists of 3 or 4 inches of light brownish-gray silt loam, with many angular fragments of shale rock scattered over the surface and through the soil section. The upper subsoil is a mottled gray, yellow, and brown, heavy and compact silt loam to silty clay loam, which is underlain by a gray, mottled yellow and brown, compact silty clay loam. The

underlying shale rock is encountered at 18 to 24 inches, and outcrops are common on the steeper slopes.

The type occupies comparatively steep slopes in the vicinity of Moravia in the southeastern part of the county. It is not an extensive soil type, occurring in only a few areas.

Internal drainage is poor, owing to the compactness of the subsoil, and the surface run-off is rather rapid owing to the steepness of the slopes. Seepage waters are common along the margins of the underlying shale beds. The soil remains in a wet or "boggy" condition during the spring months, and on drying out in the summer months the soil becomes very hard.

The type is used largely for pasture land or hay with occasional small areas for grain, principally buckwheat. Yields are comparatively low.

ALLIS SILTY CLAY LOAM

The surface soil of the Allis silty clay loam is a brownish-gray to gray heavy silt loam to silty clay loam. The subsoil is a gray, mottled yellow and drab, heavy and very compact silty clay loam to silty clay, which is underlain at 18 to 20 inches by gray and slightly greenish colored shale. The soil material is quite thin as a rule, the shale cropping out or lying near the surface. It represents a thin mantle of glacial material mixed with residual material from the shales. The subsoil is derived almost wholly from the shale beds. It is so compact that it is difficult to obtain a sample with the soil auger. Small shale fragments are common throughout the soil mass.

This soil type has a small total area in the county. Several small areas were mapped south of Aurora and two south of Owasco.

The topography ranges from gently rolling to steep. Surface waters run off rather quickly, but internal drainage is poor on account of the compactness of the subsoil and the proximity of the underlying shale beds.

Land of this type is used mostly for pasturage to which it is best adapted. A little corn and grain is planted, but yields are usually low, as the soil is droughty and crops are stunted and tend to burn during the drier part of the summer. Tillage is rather difficult owing to the compactness and heavy nature of the soil. Agricultural conditions on the type are poor and land values are low.

The type is low in organic matter and does not show the presence of lime when tested with acid. Deeper plowing, better drainage, applications of lime, and the incorporation of humus are suggested for the improvement of the soil.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Allis silty clay loam:

Mechanical analyses of Allis silty clay loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
163154	Soil, 0 to 8 inches	3.8	3.1	1.2	4.9	9.2	42.7	35.3
163155	Subsoil, 8 to 18 inches	2.7	2.8	1.0	3.2	10.0	57.1	23.2

PALMYRA GRAVELLY SILT LOAM

The surface soil of the Palmyra gravelly silt loam is a brown or light-brown to slightly reddish brown, mellow and loose gravelly silt loam to gravelly loam, 8 to 10 inches deep. The gravel content is rather high in places, and a few areas contain many cobbles and stones. The upper subsoil to a depth of 18 to 30 inches is a lighter-brown, yellowish-brown, to slightly reddish brown, more compact gravelly silt loam, which is underlain by stratified beds of gravel and sand. The subsoil is calcareous at 18 to 30 inches. The upper subsoil is usually very loose and mellow, whereas the lower subsoil is more compact because of the higher silt content. The gravel beds are composed largely of limestone material, with some shale and quartzite. The gravel has a white coating of lime, and in places is cemented together by the lime. The substratum at depths of 8 to 10 feet or more consists of a mass of unassorted gravel and till material similar to that underlying the Ontario soils. The type is derived from old stratified beds of stream terraces, glacial-lake plains, beaches, and bars.

The texture of the type is mainly a gravelly silt loam, but spots of loam and of sandy or gravelly sandy loam are mapped with the type on account of their small size. In places the type grades into the Chenango gravelly silt loam from which it differs mainly in the presence of lime in the lower subsoil.

The Palmyra gravelly silt loam occurs along Salmon Creek in the southern part of the county as a terrace or second bottom, along Owasco Inlet near Locke and Moravia, along Dutch Hollow Brook and in other small areas of alluvial fans. In the north-central part of the county it occupies glacial-lake plains, beaches, and terraces associated with the drumlins of the Ontario soils. Small areas were mapped near Weedsport, Port Byron, Spring Lake, Westbury, and Victory.

The type occupies smooth or nearly level to gently undulating stream terraces, glacial-outwash plains, deltas built into glacial lakes, and slight ridges or old glacial-lake benches. The elevation of the type ranges from 350 to 500 feet above sea level in the drumlin region, to 900 or 1,000 feet near Locke and Moravia. The stream terraces are not subject to overflow. The drainage of the glacial-lake plains and beaches is internal. As a whole drainage is good to excessive, as the soil is loose and porous. The type is fairly retentive of soil moisture and crops rarely suffer for lack of moisture during the growing season, and practically all of it is under cultivation and it has a rather high agricultural value. It is located near transportation lines and markets and has a topography favorable for intensive farming. The soil is productive and adapted to a wide range of crops. It is easily tilled, as the gravel content does not interfere with cultivation. The content of organic matter is relatively high, but can be increased by the application of manures and the plowing under of green cover crops or stubble.

The farming methods practiced on the Ontario soils are common on this type of soil. General farm crops of hay, clover and alfalfa, corn, beans, potatoes, oats, wheat, cabbage, and vegetables are grown, and also canning-factory crops of peas, beans, fruits, and berries. The yields of alfalfa and clover range from 1½ to 3 tons per acre

from two or three cuttings. Corn is grown for silage principally. Beans and potatoes produce well. Crop yields are comparable to those on the Ontario loam.

The crop rotation practiced consists of hay crops from two to four years, followed by cultivated crops of corn, potatoes, or beans for one to two years, then to wheat or oats, with seeding to grass. All available manure is scattered over the sod land before breaking for cultivated crops. Crops of clover and alfalfa are also plowed under.

Owing to its favorable topography, adaptability to a wide range of crops, productiveness, ease of tillage, and good moisture conditions, land of this type is prized highly for farming. It sells for $50 to $125 an acre, depending on location, improvements, and nearness to markets.

CHENANGO GRAVELLY SILT LOAM

The surface soil of the Chenango gravelly silt loam consists of 8 to 12 inches of light-brown, yellowish-brown, to grayish-brown, mellow and friable silt loam, carrying a high content of rounded gravel varying from one-half inch to 2 inches or more in diameter. The subsoil to a depth of 20 to 30 inches is a yellowish-brown friable gravelly silt loam, which is little if any more compact than the surface soil and rests upon stratified beds of sand and rounded gravel, which usually occur in the 3-foot soil section. In a few places the surface soil contains considerable sand and approaches a sandy loam to loam in texture. The gravel content in the soil is high in most places, but some spots are nearly free.

In a few small areas considerable quantities of slightly rounded fragments of sandstone and shale are scattered over the surface and through the soil and subsoil. The lower section consists largely of rounded stones, gravel, and sand. This variation is shallow, loose, and very porous and dries out quickly. The areas are farmed to some extent, but are not as productive as the typical gravelly areas, and are too stony in most places to admit of easy tillage.

The Chenango gravelly silt loam is developed principally in the southern part of the county as terraces along stream courses. It is not an extensive type, several small isolated tracts being mapped along Fall Creek in the extreme southeastern part of the county and a small strip northeast of Moravia. It occurs in association with Volusia, Lordstown, Wooster, and other noncalcareous soils. The soil material represents old stream terraces, consisting of stratified beds of sand and gravel, largely of sandstone and shale. Both soil and subsoil are noncalcareous.

The type occupies smooth, gently sloping, to gently undulating, stream terraces and old alluvial fans. The elevation ranges from 1,000 to 1,200 feet above sea level. Drainage is good to excessive. The soil is porous and loose and not retentive of soil moisture, and is much more droughty than the Palmyra soils.

The Chenango gravelly silt loam is used for growing general farm crops, principally grains, corn, potatoes, cabbage, and beans. The yields are not as high as on the Palmyra soils. The same general farming methods are used on this type as on the Palmyra gravelly silt loam. The usual crop rotation consists of hay for one to two

FIG. 1.—SECTION OF GRANBY SILTY CLAY LOAM

Photograph taken three-fourths mile southeast of Montezuma Station. Here the soil profile consists of 12 to 14 inches of dark-brown to black silty clay loam, underlain by gray fine sand, with rusty-brown stains

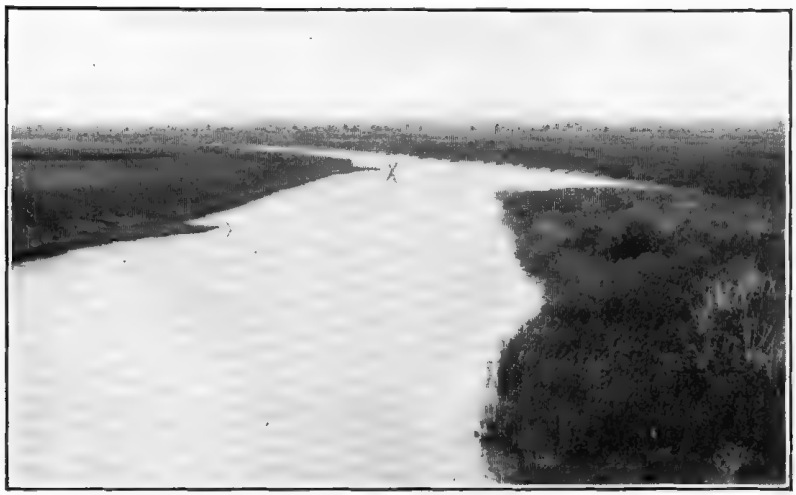
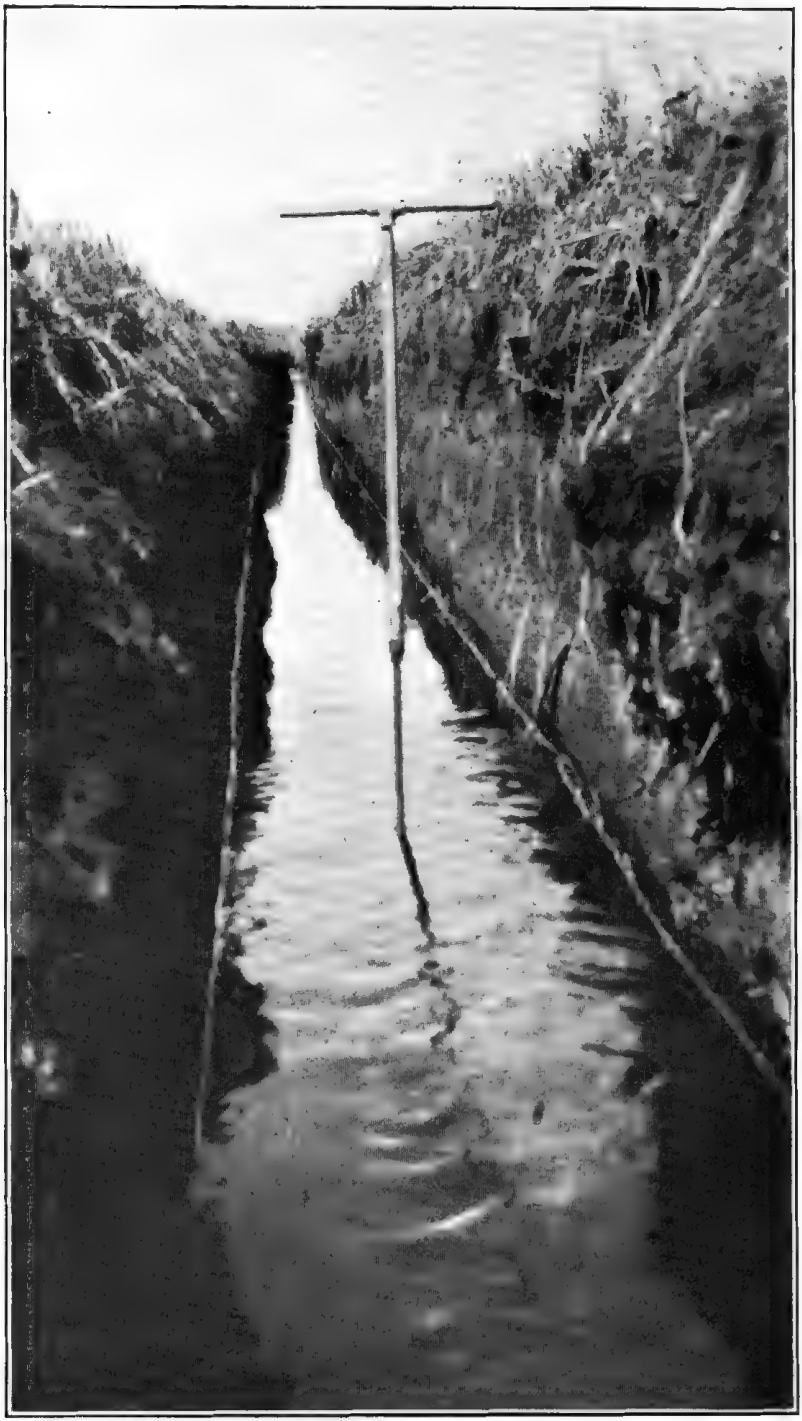


FIG. 2.—VIEW ALONG THE SENECA RIVER IN THE MONTEZUMA MARSH

The small deltas (marked X) are built out into the river by drainage waters from open ditches in the marsh. The material is largely gray marl



OPEN DRAINAGE DITCH IN THE MONTEZUMA MARSH

The upper part of the soil is black Muck, which is underlain by gray marl at 18 to 20 inches

years, corn, potatoes, or cabbage for one or two years, followed by grain crops and seeding to grass. This soil is not high in organic matter and has little or no lime. Application of manure, turning under of green crops, and the use of lime would improve the soil and make it produce better yields.

Land of this type is not as productive as the Palmyra soils and does not command as good prices.

ALTON STONY LOAM

The surface soil of the typical Alton stony loam consists of 8 to 10 inches of brown or slightly reddish brown to coffee-brown, loose and friable loam, carrying considerable sand in places. Scattered over the surface and through the soil is a high content of rounded gravel and stones, the stones varying in size from 3 to 8 inches in diameter. The subsoil to a depth of 30 inches or more is a light-brown to yellowish-brown loam carrying a high proportion of stone and gravel, which rests upon stratified beds of gravel, sand, and rounded stones. In many places it is necessary to remove the stones from the surface before the soil can be cultivated, and stone piles and fences are common on cultivated areas.

The soil is uniform in texture except in a few small areas where the sand content is higher. In some places the lower part of the 3-foot section has some compactness and a decidedly gray color. A few patches in the nearly level tracts of more poorly drained soil, which resemble the Westbury soils, were included on account of their small size. On some of the outwash plains or terraces, the material resembles the Chenango soils but is more brown in color.

The Alton stony loam occurs in the northern part of the county near Westbury and Sterling, the largest bodies being mapped northeast of Westbury. The total area is not large.

The type occupies smooth, nearly level outwash plains, gently undulating to gently sloping terraces, beaches, and bars. The elevation ranges from 400 to 450 feet above sea level. The soil is derived mainly from old stratified deposits of sandstone, shale, and crystalline rock material, reworked by the waters of glacial Lake Iroquois, which had an elevation of 450 to 460 feet above sea level.

The type is well to excessively drained, owing to the loose, open nature of the soil, which is not retentive of soil moisture.

From 80 to 90 per cent of the Alton stony loam is under cultivation. The type is recognized as a good farming soil, the topography, as a whole, being favorable for intensive farming. The organic matter content is moderate to high, and is maintained by turning under manure and green-manure crops. The stones interfere to some extent with cultivation, and in many places the larger loose stones have been removed.

The field crops include corn, hay, wheat, oats, potatoes, and beans. A considerable acreage is planted to navy beans. Corn is not a sure crop as it matures late, and the soil is inclined to be droughty. Hay crops give light yields. Much of this type is devoted to fruit growing, principally apples, with some small fruits and berries. Most of the orchards are cultivated to other crops, such as beans and potatoes.

This soil should be used more extensively for special crops, such as apples and berries. Deeper plowing, removal of stones, and the plowing under of manure and green crops should be more universally practiced.

Land of this type sells for $50 to $100 an acre, except that orchard tracts bring much higher prices.

SCHOHARIE SILTY CLAY LOAM

The surface soil of the Schoharie silty clay loam is a light-brown or grayish-brown to slightly reddish brown silt loam to silty clay loam, 5 to 8 inches deep. The surface soil of cultivated fields has a decidedly grayish cast when dry. The upper subsoil is a reddish-brown to pinkish-brown, stiff silty clay to clay. The lower subsoil from 20 to 36 inches or more is a reddish-brown to pinkish heavy and compact clay, which contains gray lime streaks, and effervesces when tested with acid.

Although the soil is not quite as heavy as the silty clay, it tends to clod if plowed when too wet. In a few patches the surface material is grayish brown and the subsoil contains slight mottlings of yellow, gray, and brown. Such areas occupy slight depressions where drainage is not very good.

The topography is gently rolling to undulating, with smooth slopes and is favorable for intensive cultivation.

The larger part of the Schoharie silty clay loam occurs in association with the Schoharie silty clay and the Poygan silty clay loam in the central part of the county in the vicinity of Auburn. It comprises only a few square miles.

The larger part of the type has been cleared and is under cultivation, principally to grain and hay crops. The methods of cultivation and the yields of crops on this type are similar to those on the Schoharie silty clay.

SCHOHARIE SILTY CLAY

The surface soil of the Schoharie silty clay consists of 6 to 10 inches of light-brown or reddish-brown to grayish-brown silty clay to silty clay loam, which is quite gray when dry in cultivated fields. The subsoil to a depth of 20 to 36 inches is a reddish-brown to decidedly pinkish colored, heavy tenacious and compact clay to silty clay, which is more or less impervious and when wet is sticky and plastic. Gray lime streaks are common through the subsoil, especially the lower part. The lower part of the 3-foot section consists of pinkish-colored material, streaked with gray or white lime, and is highly calcareous, effervescing freely with hydrochloric acid.

In a few areas the texture varies from silt loam to silty clay loam. In some places the soil section rests upon unassorted till material, but generally the lake-laid clays extend from 5 to 30 feet or more below the surface. The soil is practically free from gravel or stones. In some nearly flat or poorly drained spots the upper subsoil is slightly mottled gray and yellow before the pinkish clays are encountered. In a number of swales or slight depressions, where drainage is imperfect and conditions favored the accumulation of vegetable matter, the surface soil is darker colored than typical.

The soil material of this type is the result of deposition of fine particles in glacial-lake waters at the close of the ice period. It occupies terraces and lake plains and the lower levels in the through valleys. The material is largely from limestone, sandstone, and shale. The reddish to pinkish color is due largely to the abundance of material derived from red sandstone.

The Schoharie silty clay occupies several square miles in the vicinity of Cayuga, Union Springs, Aurora, and near Auburn, where it is more typically developed. Along Owasco Inlet and Salmon Creek are several areas where the material was deposited in the through valleys by ponded waters as the ice retreated to the north. The topography in the north-central part of the county is gently rolling to undulating, with some smooth to nearly level tracts. In the through valleys, where erosion has been active, the topography is more rolling to hilly, morainic, and steep. Along the valley sides the type occupies rolling to steep slopes.

This soil type is rather hard to handle. If plowed when too wet or too dry it forms clods that do not pulverize easily. The surface soil often cracks to a depth of several inches during the drier part of the summer. Drainage is largely internal and owing to the compact nature of the subsoil it is often deficient. Surface waters run off rather slowly, owing to the rather flat surface of the greater part of the type. Because of the poor natural internal drainage, much of the type is in need of tile drainage.

The type originally was forested with a growth of hardwoods and some pine, but the larger part is now cleared and farmed. Corn, small grain, hay—timothy, alfalfa, and clover—some cabbage, and a few potatoes are grown. Corn, which is grown mainly for silage, gives high yields. Grain crops do fairly well. The type seems to be well adapted to hay crops, especially legumes, which commonly yield 2 to 3 tons per acre. Cabbage does fairly well. The type is not considered well adapted to the growing of potatoes.

Deep plowing, incorporation of organic matter in the form of manure or green crops and tile drainage will materially improve the physical condition and increase the productivity of this soil.

Land of this type is held at $50 to $100 an acre.

POYGAN SILTY CLAY LOAM

The surface soil of the Poygan silty clay loam is a brown, grayish-brown, or dark-brown to nearly black silty clay to silty clay loam. The darker-colored areas represent the more poorly drained parts and the brown to grayish-brown areas are the better drained parts. The surface soil is only a few inches in depth, representing a thin mantle of material. The subsurface layer, extending to depths of 8 to 12 inches, is a grayish-brown to slightly mottled gray, yellow, and brown silty clay loam. The subsoil is a reddish-brown to pinkish, heavy, plastic, tenacious clay, with some streaks of gray or white lime, and is very similar to the subsoil of the Schoharie series.

The soil is derived from lake-laid materials, occupying flat, poorly drained areas, where the accumulation of vegetable matter has given the surface soil its dark color. The type occurs in association with the Schoharie soils in the central part of the county, in the

vicinity of Auburn and Sennett. Drainage is poor, owing to the flatness of the surface and the impervious nature of the subsoil. As a rule the type occupies depressions a few feet below the level of the surrounding soils.

Very little of the type is farmed, because the soil remains wet or saturated much of the time, and artificial drainage would be very costly. Part of the type is forested to hardwoods, and the greater part is used only for pasture. A few small tracts are used for hay crops, to which the better-drained parts are adapted.

DUNKIRK VERY FINE SANDY LOAM

The surface soil of the Dunkirk very fine sandy loam is typically a light-brown or slightly yellowish brown to grayish-brown mellow and friable very fine sandy loam, 8 to 12 inches deep. The subsoil to a depth of 3 feet or more is a yellowish-brown to yellowish slightly more compact very fine sandy loam to fine sandy loam. The substratum for several feet below the soil section consists of stratified beds of very fine sand, silt, and clay. The type is practically free from gravel and stone. A few small areas are included in which the surface soil is a fine sandy loam to sandy loam in texture, though typically the material is very fine sandy loam. A few slight mottlings of gray occur in the lower part of the soil section where the topography is smooth and nearly flat and the drainage is less thorough. The soil as mapped in the northern part of the county is slightly darker brown in color than that in the vicinity of Auburn.

The type is developed in the northern portion of the county and in the vicinity of Auburn. Scattered areas were mapped in the vicinity of Duck, Otter, and Cross Lakes, and a few small areas were mapped along Owasco Inlet and along Salmon Creek. The type, although occupying comparatively small areas, comprises a total area of 13.3 square miles.

The topography ranges from smooth and gently sloping to rolling or morainic. The larger part of the type is gently undulating to gently rolling, and practically all of it can be cultivated intensively. Drainage is largely internal, and owing to the sandy, loose nature of the soil, is good.

The Dunkirk very fine sandy loam is an important soil type. It is easy to till and adapted to a wide range of crops. The larger part of the type is under cultivation, and a few small areas are in forest. General farming, fruit growing, and trucking are important on this type. Hay yields from 1 to 2 tons per acre, oats from 25 to 45 bushels, wheat from 12 to 15 bushels, and potatoes from 100 to 200 bushels. This soil type is well adapted to truck farming, as it is easily tilled and warms up early, and is used largely for truck crops in the vicinity of Auburn and to some extent elsewhere. Considerable fruit is raised, principally apples, peaches, and cherries. The yields and quality of fruit are good.

The larger part of this soil is intensively and well farmed. All available manure is plowed under to increase the supply of organic matter in the soil. Crop rotation is practiced. Some commercial fertilizer is used with special crops.

The areas of this type that are well located with reference to markets command a high price, but the more remote areas do not sell for as much, the price ranging from $40 to $100 an acre.

DUNKIRK SILT LOAM

The Dunkirk silt loam to a depth of 8 to 12 inches is a light-brown or brown to grayish-brown mellow silt loam, practically free from gravel and stone. The subsoil is a light-brown or yellowish-brown to slightly grayish-brown, more compact silt loam. The substratum consists of thin beds of stratified fine sand, silt, and silty clay, the heavier layers below 4 feet usually containing considerable free lime. Plowed fields, when dry, have a grayish-brown to grayish cast. The soil varies from the silt loam texture in local spots where there is considerable sand and fine sand material. The areas adjacent to the Worth loam are often more gritty than typical and approach a loam in texture. On the flatter parts of the type the subsoil is more compact, slightly heavier in texture, and somewhat mottled with gray and yellow, but such areas are small.

The soil has weathered from the heavier stratified materials deposited in lake basins at the close of the ice period.

This type is mapped principally in the northern part of the county. It occurs in association with the Worth soils and in places it grades into the smooth phase of the Worth loam. Many small areas of this type are mapped in the belt from 8 to 12 miles wide extending across the county north of Cato, the largest areas occurring in the vicinity of Sterling. A small area is mapped along Salmon Creek in the southern part of the county, where there was some local lake influence during the glacial period.

The topography is uniformly gently sloping to slightly rolling. In a few places the type occupies nearly level to gently undulating benches or terraces of old lake plains. The greater part of the type lies below the level of old Lake Iroquois, which was 450 to 460 feet above sea level. Drainage is largely internal, and is good as a whole, except for a few of the small, rather flat areas.

The Dunkirk silt loam has a relatively high agricultural value, as it is easily tilled and is adapted to a wide range of crops. The principal crops are corn, oats, wheat, cabbage, and timothy hay, with some potatoes. Considerable fruit, consisting of apples, pears, and berries, is grown, though there are no large commercial orchards situated entirely on this type. The fruits yield well and are of good quality. Corn is cut largely for silage and the tonnage is high. Hay yields from 1 to 2 tons per acre, oats from 30 to 50 bushels, wheat from 12 to 18 bushels, and cabbage from 6 to 10 tons. Potatoes do not yield as high as on some of the other soil types. A rotation used to some extent consists of hay crops for two to three years, followed by corn, cabbage, or potatoes for one to two years, and then grain with a seeding of grass for hay.

This type is recognized as a good hay and grain soil. Some local spots would be helped by artificial drainage. The soil is only fairly well supplied with organic matter and tends to form clods if plowed too wet or too dry. Deeper plowing and the incorporation of manure or green stubble will do much to improve the productiveness of the

type as well as its physical condition. Land of this type is held at $50 to $100 an acre.

GRANBY SILTY CLAY LOAM

The surface soil of the Granby silty clay loam consists of 8 to 10 or 12 inches of dark-brown or dark-gray to black silty clay loam, heavy and in places plastic on the surface. In a few places the surface soil is dark brown, streaked with gray and rusty brown. The upper subsoil to a depth of 20 to 24 inches is a mottled gray, yellow, and rusty-brown, to gray and drab, somewhat compact silty clay, which is underlain by stratified beds of gray and yellow fine sand (Pl. XXVI, fig. 1) or locally by a pinkish clay, which occurs as lenses and resembles the Schoharie subsoil. The soil is sticky when wet and the upper subsoil compact, stiff, and plastic.

The type is developed upon stratified deposits laid down during the ice period in local lake beds or glacial-stream channels. The material is derived largely from sandstone and shale and is generally noncalcareous. Areas in association with the Ontario soils may effervesce in some cases. The pinkish clay which is present in the lower subsoil in places shows the presence of lime carbonate.

The topography as a whole is smooth and nearly level to gently sloping. The soil occupies the depressions or swales between the drumlins in association with the Ontario soils, and smooth nearly flat areas in association with the Honeoye soils in the southern part of the county. The type has a fairly large total area in the county, though the individual tracts are not large. Narrow strips are common in the north-central part.

Internal drainage is poor and water stands on the surface for long periods, keeping the soil in a wet or saturated condition much of the time. In some of the more poorly drained areas the surface has a thin veneer of muck material formed of decaying vegetable matter. The type as a whole is rich in organic matter.

Only a small proportion of this type has been put under cultivation. Most of it supports a growth of maple, ash, elm, and other trees. Water-loving plants grow abundantly. The type is largely used for pasture and for forestry. In its present condition it has a very low agricultural value, but with proper drainage it could be used for special crops.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Granby silty clay loam:

Mechanical analyses of Granby silty clay loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
163142	Soil, 0 to 10 inches	1.4	0.6	0.4	12.4	25.6	45.4	14.1
163143	Subsoil, 10 to 24 inches	.1	.4	.4	3.8	17.2	48.0	30.1
163144	Subsoil, 24 to 36 inches	.0	.1	.1	5.4	42.7	40.8	10.8

TYLER VERY FINE SANDY LOAM

The Tyler very fine sandy loam to a depth of 10 to 12 inches is a brownish-gray to gray friable very fine sandy loam, underlain to a

depth of 24 to 30 inches by mottled yellow, gray and rusty-brown very fine sandy loam, which in turn is underlain by grayish stratified fine sand. The type is free from gravel. In a few places the soil is more nearly a loam in texture, but such variations are small in extent. Cultivated fields often present a spotted appearance owing to the turning up of yellow-colored subsoil material.

This type is inextensive in this county. The largest area occurs around Montezuma near the Seneca River. A few small areas lie south of Westbury. The surface is smooth to slightly hummocky, or is marked by slight ridges and intervening swales. Drainage is internal and is good to excessive, owing to the porous nature of the subsoil.

The larger part of this type is used for wheat, oats, buckwheat, and timothy hay. The yields are only fair, as the soil is not retentive of moisture and is inclined to be droughty during the drier part of the summer. The soil is lacking in organic matter, and applications of manure and turning under of green cover crops will aid in building it up. Applications of lime would also prove helpful, especially for growing legumes.

TYLER SILT LOAM

The surface soil of the Tyler silt loam to a depth of 8 to 10 inches is typically a light brownish-gray silt loam. The upper subsoil is a light-yellow or yellow, gray, and rusty-brown mottled silt loam, with considerable very fine sand in places. The lower subsoil below 18 to 20 inches consists of variable textured material of mottled gray and yellow color. In places the lower part of the 3-foot section consists of stratified beds of yellow and gray fine sand, and contains pinkish clay in a few spots. The type is free from stone and gravel. A few small areas of a silty clay loam texture are included with the type. In cultivated fields when comparatively dry the surface presents a conspicuous grayish cast. Freshly plowed fields often present a spotted gray and yellow appearance, caused by turning up the yellowish-colored subsoil.

This type represents an intermediate condition between the darker, more poorly drained Granby soils on one side and the lighter-colored, better-drained Dunkirk soils on the other. The soil material is derived from deposits of shale and sandstone material and is noncalcareous.

The Tyler silt loam is not extensive in this county. The principal area lies near the Montezuma Marsh, north of Port Byron, and north of Weedsport.

The type occupies glacial stream channels, lake terraces, or lake plains, at an elevation of 350 to 400 feet above sea level. The topography is predominantly smooth or nearly level to very gently undulating. Drainage is internal for the most part. The heavier portions are not very well drained on account of the compact nature of the subsoil.

A large part of the Tyler silt loam has been cleared and is under cultivation to crops of corn, oats, wheat, and timothy hay. A few patches of alfalfa were noted. Liming is necessary to get a good stand of alfalfa. Cabbage, potatoes, and other vegetables are also grown. Good yields are obtained on the better-drained parts of the

type. Proper drainage by open ditches and tile, incorporation of additional vegetable matter, and application of lime will do much to increase the productiveness of this soil.

This type is well located with reference to transportation, and sells for $50 to $75 an acre.

TYLER SILTY CLAY LOAM

The typical surface soil of the Tyler silty clay loam is a brownish-gray to gray silty clay loam, 8 to 12 inches deep. The subsoil to a depth of more than 3 feet is a mottled gray, yellow, and rusty-brown compact silty clay loam to clay, having a pronounced granular structure when dry. The subsoil material is compact and heavy in place.

This type occupies smooth, nearly level, glacial-lake beds. It occurs in close association with the silt loam type in the north-central portion of the county near the Seneca River and has a small total extent in the county. The origin of the soil material is similar to that of the silt loam. Drainage is internal and is poor on account of the compact nature of the subsoil.

Only a small part of the type is under cultivation, as it requires drainage before it can be cultivated. The heavy texture of the soil makes it hard to till, and it should not be plowed when too wet or too dry, as it tends to clod and bake. The general recommendations for the improvement of the silt loam type are applicable to this type. When properly drained by ditches or tiling, this soil produces good yields of hay crops and grain.

GENESEE SILT LOAM

The surface soil of the Genesee silt loam to a depth of 10 to 12 inches is a brown to dark-brown, smooth, mellow silt loam. The upper subsoil is a lighter-brown to brown, slightly heavier, friable silt loam. The lower subsoil at 30 to 36 inches usually shows some mottlings of gray and rusty brown. Sand and gravel generally occur below the 3-foot depth, and in a few areas stratified beds of sand occur in the lower subsoil. As a whole the type is free from gravel and stone. The type consists of material washed from the adjacent uplands and deposited by streams along their courses in time of overflow, the material being originally derived from shale, sandstone, and some limestone.

While the surface soil is typically a silt loam in texture, a few areas of sandier-textured material occur on the slight ridges or along the banks of the streams. In a few places where swales or depressions occur the immediate surface soil is black in color, and varies from a thin veneer of muck to a silty clay.

The Genesee silt loam is not extensive in Cayuga County. It occurs as narrow bottom lands along most of the larger streams of the southern part of the area. Areas were mapped along Salmon Creek, Dutch Hollow Brook and Owasco Inlet in the southern part, and along smaller streams near Port Byron, Weedsport, and elsewhere in the north-central part.

The topography is smooth and gently sloping to nearly level, modified by depressions and slight ridges of a few feet. The type lies

from 5 to 10 feet or more above the normal stream level, and is subject to occasional overflow by stream waters. As a whole drainage is good to fair. A few of the lower depressions or swales would be improved by artificial drainage.

The type is fairly well supplied with organic matter. Usually the lower subsoil shows the presence of lime carbonate when tested with acid, but applications of lime would no doubt prove beneficial, especially for legume crops.

Originally all the type was forested with ash, elm, maple, oaks, willow, and birch. A large part of the type has been cleared and is used for growing crops. Hay, oats, corn, cabbage, and a few potatoes are grown on the cultivated areas, but the larger part of the type is devoted to hay crops and pasture. Timothy, or timothy and clover mixed, yield from 1½ to 2 tons per acre. Corn yields from 25 to 60 bushels of grain or 6 to 10 tons of silage per acre. Yields of other crops are fair to good.

This type is considered desirable for farming and is held at $25 to $75 an acre, varying with location and improvements. Better drainage and protection from overflow by deepening stream channels or constructing levees along the banks are suggested for the improvement of this soil type.

HOLLY SILTY CLAY LOAM

The surface soil of the Holly silty clay loam to a depth of 6 to 8 inches is a brownish-gray or yellowish-gray to gray silt loam to silty clay loam. The subsoil is a more compact silt loam to silty clay loam, mottled gray, yellow, brown, and drab. The lower subsoil is usually more gray to drab in color, while the upper subsoil is yellow and brown. In places in the lower part of the 3-foot section stratified beds of sand and silt occur, with some gravel beds in local spots. Variations of the type range from a thin covering of dark to nearly black muck on the surface of more poorly drained areas, to sandy or fine sandy loam on the slight ridges or higher elevations. The darker-colored areas resemble the Papakating soils, while the better-drained areas of brown color resemble the Genesee soils. Typically the soil is a silty clay loam, but variations in texture range from sandy loam to silty clay; such areas are small and are included with the type as mapped.

The soil material is alluvial in origin, having been washed from the surrounding uplands and deposited by streams along their courses. It is noncalcareous in the 3-foot section.

The Holly silty clay loam is confined to comparatively narrow strips of first-bottom land along drainage courses, mainly in the southern part of the county. The largest areas were mapped along Salmon Creek near Venice Center and along Owasco Inlet near Moravia. A few other areas were mapped, but the type as a whole is not very extensive.

The topography is level to gently sloping in the direction of stream flow. Low swales occur in the general level of the type. The streams are usually sluggish, having very little fall. The type is subject to overflow, and natural drainage is poor. Proper drainage by ditching is essential for the growing of cultivated crops.

Originally all the type was forested. Only a small proportion of it has been cleared. Grasses and water-loving plants thrive and afford good pasturage for livestock. The type is comparatively rich in organic matter, and where cleared and drained it is a productive soil for corn, oats, and hay.

PAPAKATING SILTY CLAY LOAM

The Papakating silty clay loam to a depth of 10 to 12 inches is a dark-brown to nearly black silty clay loam, which is underlain by a brown to light-brown more compact silty clay loam to silty clay. The lower portion of the 3-foot section is mottled yellow, gray, and rusty brown. In the more poorly drained parts the mottlings occur at 18 to 20 inches. In places, especially near the stream courses, the surface soil contains some sandy material. In the lower more poorly drained areas the surface has a veneer of a few inches of muck material.

This type is not extensive and occurs principally along Owasco Outlet and along the Seneca River in the north-central part of the county. It occupies smooth, nearly level first-bottom lands, subject to occasional overflow. Streams flowing through the type have very little fall and are sluggish. Seepage from the adjacent uplands is common. Drainage is only fair to poor, as the topography is not favorable for run-off of surface water and the compact nature of the subsoil is not conducive to good internal drainage.

Originally all the type supported a growth of elm, maple, ash, and water oaks. Only a small part has been cleared and put under cultivation. Where properly drained the soil is adapted to corn, oats, and timothy hay. Good yields are obtained during the dry seasons. Where not drained, the type is used for pasturage and forestry.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Papakating silty clay loam:

Mechanical analyses of Papakating silty clay loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
163138	Soil, 0 to 12 inches	0.8	0.8	0.3	2.8	5.6	50.2	39.5
163139	Subsoil, 12 to 36 inches	.2	.3	.3	5.0	7.3	46.2	40.7

MUCK

Muck consists of more or less decayed vegetable matter having a dark-brown to black color with some admixture of silt and clay in places. The soil has a smooth feel, showing that the particles are finely divided. Over the larger part of the soil the material to a depth of 15 to 18 inches is well decomposed, there being little or no fibrous or woody material, but below this depth in some places the material shows a fibrous or woody structure, and is not so thoroughly decomposed as the upper portion, often approaching peat in structure.

As a whole the Muck beds are quite uniform in color and structure to depths of 3 feet or more, and in places they extend to depths of 10 to 15 feet. In some places there is a variation in the character of the underlying material. In places, however, the Muck is underlain by a dense blue or gray clay, while in others the underlying material is marl of a white chalky appearance. The areas underlain by marl at 8 to 20 inches have been mapped as Marsh. The broader, more extensive areas, as mapped in the north-central part of the county, are usually 3 feet or more in depth. A few smaller areas in the southern part are not quite so deep and are underlain by blue or gray heavy clay at 30 to 36 inches.

Muck is extensive in the northern and north-central parts of the county, north of Auburn, and associated with the drumlin region. The largest areas lie near Duck Lake, Port Byron, Otter Lake, Parker Pond, and Sterling Station in the northern part, with one area near Lake Como in the southeastern corner of the county. A few smaller areas occur in the southern part of the county, and many small areas are scattered through the drumlin region. The elevation of the greater part of Muck ranges from 375 to 500 feet above sea level. The area near Lake Como lies at an elevation of 1,300 feet.

Muck is very poorly drained, owing to its flat, smooth topography with little or no slope. It remains in a moist or saturated condition much of the time; the water table is high and water stands over much of it very late in the spring. Streams flowing through areas of Muck are sluggish, having very little grade.

In its natural condition, Muck supports a growth of maple, elm, ash, alder, willow, birch, wild grasses, reeds, and water-loving plants. Only a small part of the Muck in this area has been reclaimed by drainage and clearing of forest growth. The largest area of developed Muck land lies near Port Byron, and areas of a few acres are developed in the north-central part. Where properly drained by means of large open ditches and smaller open laterals, Muck is a very desirable and profitable soil for the production of special crops, such as celery, onions, lettuce, spinach, carrots, potatoes, cabbage, and other vegetables. Celery yields from 150 to 200 crates per acre, onions from 400 to 600 bushels with some yields as high as 1,000 bushels, lettuce from 400 to 600 boxes, carrots from 800 to 1,000 bushels, and spinach from 3 to 6 tons. Potatoes yield from 150 to 300 bushels. Yields are quite variable, according to the season.

Commercial fertilizers are used with truck crops. From 500 to 1,000 pounds of a mixture of phosphoric acid and potash, in which the proportion of potash is exceptionally high, is usually applied broadcast and harrowed into the soil. Nitrogen is applied to celery and lettuce.

Well-drained Muck lands are very desirable for special crops and prove very profitable if skillfully handled. Most of the farmers on the Muck land are specialists in the handling of Muck soils and growing the crops best adapted to them. Good drainage is very essential. The areas properly drained are few, owing to the fact that an outlet for drainage waters is hard to find. The larger areas of Muck can best be drained by cooperative effort of the landowners, as the cost of clearing and draining Muck areas is high.

Most of the areas of Muck in the county are well located with reference to railroad facilities. A storage plant is located at Port Byron. Well drained and developed Muck land near markets sells for $500 to $1,000 an acre.

MARSH

The soil material of Marsh consists of a layer of dark-brown to black muck, from 8 to 20 inches deep, which varies from partly decomposed fibrous material to smooth black muck, and rests upon white to chalky-colored marl carrying a high content of small shells. Marsh is confined to the low-lying poorly drained or water-logged areas associated with Muck and having the marl layer in the 3-foot section.

The largest areas of this class of material are in the Montezuma Marsh, and along the Seneca River in the north-central part of the county. (Pl. XXVI, fig. 2.) Other areas occur in the drumlin region, along Little Sodus Creek and bordering Lake Ontario. The elevation ranges from 380 feet along the Seneca River to 246 feet above sea level along Lake Ontario. Drainage is poor, and the material is under water or wet and swampy the greater part of the year.

Marsh supports a growth of cat-tails, rushes, and other water-loving plants, with only a few trees. In a few places the cat-tails are cut in the fall and shipped to furniture factories. Only a few small tracts have been cleared and cultivated. As observed on a small tract where the marl underlies the muck at 18 to 30 inches, salt incrustations appear on the surface after it is cultivated.

The larger part of the area mapped as Marsh is low lying and has only a slight fall, so that it would be difficult to drain (Pl. XXVII). Along the Seneca River it would probably be necessary to lower the level of the water in the river before the adjacent Marsh could be drained. The areas near Lake Ontario are only a few feet above the level of the lake, and it would be difficult if not impossible to drain them. In its present state Marsh has little or no agricultural value.

MEADOW

The soil mapped as Meadow varies widely in color, structure, and texture of material, ranging from almost muck to clay in texture and from gray to black in color. The type occupies low poorly drained areas in association with the soils of the southern part of the county.

Generally the surface soil is a dark-gray or grayish-brown to almost black heavy silt loam, silty clay loam or clay. The subsoil is consistently mottled gray, yellow, brown, and drab and is a silty clay to clay in texture. Owing to the heavy nature of the subsoil and the low-lying position, drainage is poor. In a few places the surface soil consists of a few inches of partly decomposed vegetable matter or nearly black muck, which is underlain by gray or mottled gray and yellow heavy clay. A strip of this kind occurs along Fall Creek in the southeastern part of the county where some material has been washed from the adjacent uplands. The stream here is very sluggish and the area remains wet or under water much of the time. The areas in association with the Volusia soils in the southeastern part of the county are quite "seepy" and remain "boggy"

much of the time. Other areas in the southern part of the county occupy swales or lower-lying lands with poor drainage. The topography is flat to gently sloping.

Very little of this soil is under cultivation, being too poorly drained in its present condition for growing crops. The larger part is in forest or supports a growth of water-loving plants and is used for pasture. In its present condition it is suited only for grazing and forestry.

STEEP BROKEN LAND

Steep broken land really represents a topographic difference rather than a soil difference. The areas consist mainly of steep slopes along the west shore of Skaneateles Lake, rising from an elevation of 867 feet at the lake to 1,700 feet above sea level at a distance of one-half to three-fourths mile. The slope is too steep for farming. The soil material consists of a light-brown to yellowish-brown silt loam to stony silt loam, underlain by a yellow to light yellowish-brown silt loam, with a high content of angular stones. The underlying shale and sandstone occur in the 3-foot section and often outcrop on the surface. The soil material represents Lordstown soils. The areas along Owasco Inlet and west of Dresserville have about the same soil conditions as those described above. The surface, as shown by the contour lines on the map, is quite steep, rising several hundred feet in a short distance. A few narrow areas were mapped along stream gulches or canyons, one north of Aurora along Great Gully Brook, one south of Ellsworth along Cayuga Lake, and a few smaller areas along Owasco Lake. The areas on the west side of Owasco Lake are associated with the Honeoye soils, and the material is a brown silt loam. Rock outcrops are common and canyonlike walls occur along the stream courses.

None of this land is farmed, owing to its steep broken topography. The larger part of it is forested to oaks, hickory, maple, and chestnut. It is best suited for forestry, with some areas which may be used for pasture.

SUMMARY

Cayuga County lies near the center of the Finger Lakes region of central New York. It extends from Lake Ontario on the north for about 60 miles south, and comprises an area of 703 square miles, or 449,920 acres.

The surface of the county is varied. It has a range in elevation from 246 feet above sea level to more than 1,800 feet. The northern part ranges from 250 to 500 feet above sea level. The topography of the area varies from smooth, nearly level, gently sloping, undulating, hilly, and morainic to steep and broken.

As a whole the county is well drained, though there are areas occurring in association with the better-drained soils that need drainage, and there are other areas, like the one along the Seneca River, that are wet or saturated much of the time. All the drainage eventually reaches Lake Ontario.

Settlement began the latter part of the eighteenth century, and the county was organized in 1799. The population of the county in 1920 was 65,221. Auburn, the county seat, has a population of over

36,000 and is a manufacturing center. The rural population has been gradually decreasing.

Transportation facilities are good, there being a number of railroads, and the main roads are surfaced and in good condition. The rural sections are well supplied with telephone service and delivery of mail.

Climatic conditions are favorable for growing and maturing a variety of farm crops. The mean annual temperature at Auburn is 47.2° F., the maximum being 100° F. and the minimum —18° F. The mean annual precipitation is 36.80 inches, which is well distributed. The mean precipitation for the summer months is 11.17 inches. The normal growing season or the frost-free period is 161 days.

General farming and dairying are the principal agricultural industries, with considerable truck farming in some localities. The principal crops are alfalfa, clover, timothy, corn, oats, wheat, rye, barley, buckwheat, potatoes, cabbage, and beans.

Considerable fruit is grown, especially in the region bordering on Lake Ontario. Hay and grain crops lead in acreage. Potatoes are important in the agriculture of the area. Dairying is carried on quite extensively with general farming, and the cash income of many farms is largely from this source. In 1920 there were 4,297 farms in the county, of an average size of 92.2 acres. Over three-fourths of the farms are operated by owners.

Buildings and farm equipment are good. Land values range from $10 to more than $100 an acre, with orchard lands and truck farms held at much higher prices.

The soils of the county are variable in texture, color, mode of formation, drainage, lime content, and amount of organic matter present. The more extensive soils of the county represent partly weathered till material of varying thickness, with some residual material from the underlying geological formations. Other soils are formed of material laid down in water at the close of the ice period, materials reworked by lake waters, more recent alluvial deposits along the stream courses, and accumulations of organic matter.

Twenty-seven soil series are represented by 35 types, and 7 phases. In addition, Muck, Marsh, Meadow, and Steep broken land were mapped.

The Lordstown and Volusia soils are derived from shallow till material, mainly from shale and sandstone, and are noncalcareous.

The Lordstown soils are usually light brown to yellowish in color, have little or no compactness in the subsoil, and are well drained. They are best adapted to hay crops, corn, and potatoes.

The Volusia soils are usually grayish in color, with a mottled compact subsoil. Drainage is poor as a rule. These soils are best suited for hay and pasture.

The Wooster, Worth, Westbury, Canfield, and Chippewa soils represent thick till material that is noncalcareous. The material is mainly from sandstone, shale, and conglomerates, with some igneous rocks.

The Wooster soils are well-drained light-brown to yellowish soils with little or no compactness in the subsoil.

The Worth soils are brown to light brown, with a slightly yellowish brown subsoil having little or no compactness. Drainage is good.

The soils of the Westbury series range from grayish brown to gray and nearly black, underlain by compact partly weathered till. Drainage is poor.

The Chippewa soils are grayish brown or dark brown to black, underlain by a mottled yellow, gray, and brown to gray and drab, compact, heavy subsoil. Drainage is poor.

The soils of the Canfield series are light brown to yellowish brown, underlain by a yellow to yellowish-brown friable upper subsoil and a more compact and mottled yellow, gray and brown lower subsoil, Drainage is fair, better than on the Volusia soils, but not as good as on the Wooster soils.

The Honeoye, Ontario, Lyons, Cazenovia, and Lansing soil series represent soils derived from deep till material, mainly from limestone, and are calcareous.

The Honeoye soils are brown, underlain by a light-brown to slightly yellowish brown, friable subsoil, which is crumbly and granular in structure when dry. Drainage is good. The soils are highly calcareous.

The Ontario soils are brown, with a yellowish-brown friable subsoil. Drainage is good as a whole. These soils are calcareous, but are not as high in lime as the Honeoye soils.

The Lyons soils are dark brown to grayish brown in color, underlain by a mottled and more compact subsoil. Drainage is fair to poor.

The Cazenovia soils are brown in color, with a brown more compact and heavy subsoil. Drainage is good.

The Lansing soils are brown, with a yellowish-brown subsoil, carrying some limestone material but more of shale. The soils are calcareous in the lower part of the 3-foot section.

The Groton gravelly loam is derived largely from limestone material and is calcareous. It occupies kames and eskers consisting of stratified material deposited under glacial ice. The soil is brown to yellowish, the subsoil is loose and open, and drainage is good to excessive.

The Farmington silt loam represents material derived from thin till overlying limestone. The soil is brown to ocherous brown in color, and the limestone is usually reached in the 3-foot section. Drainage is good.

The Lockport and Allis series represent thin till material overlying shales. The Lockport soils are reddish brown in color with a reddish-brown to pinkish-colored more compact subsoil. The underlying red and gray shales are usually encountered in the 3-foot section. The Allis soils are light grayish to yellowish gray to gray in color, with a mottled gray and yellow, heavy and very compact subsoil. Internal drainage is poor, but surface waters run off rather quickly owing to the sloping topography.

The Palmyra series represents material largely from stream terraces and reworked lake terraces, principally of limestone gravel with some sandstone and crystalline gravel influence. The soils are

brown, with slightly compact subsoil. The lower subsoil is calcareous. Drainage is good.

The Chenango and Alton series represent terrace material, largely from sandstone, shale, and conglomerates, with some limestone influence. The soils of the Chenango series are light brown with a lighter to yellowish-brown friable subsoil. Drainage is good to excessive. The Alton soils are brown to coffee colored, with a brown subsoil. The material represents reworked glacial-lake terrace. Drainage is good. The soils of this group are noncalcareous.

The soils of the Schoharie series represent lake-laid calcareous material. The soils of this series are brown to grayish brown in color, with a pinkish-colored subsoil which is heavy and compact in place. Internal drainage is only fair. The Poygan silty clay loam is a flat, poorly drained, grayish-brown to black soil, closely associated with the Schoharie soils.

The Dunkirk soils are light brown to yellowish brown in color, with stratified layers of fine sand, silt, and clay in the subsoil or substratum. Drainage is good as a whole, though there are some spots in the heavier-textured types that are in need of artificial drainage.

The Granby soils are dark to nearly black in the surface, with stratified mottled layers in the upper and sands and clays in the lower subsoil. Drainage is poor.

The soils of the Tyler series are grayish brown to yellowish brown, with a yellowish-brown or mottled yellow, gray, and brown subsoil, underlain by stratified beds of sand and clay. Drainage is fair on the heavier to good on the sandier members of the series.

The Genesee silt loam is derived from recent stream deposits and is calcareous. The soil is brown, with little change in color or structure in the 3-foot section. Drainage is good for the most part.

The soils of the Holly and Papakating series include first-bottom lands that are noncalcareous. The Holly silty clay loam is grayish brown in the surface, with a gray, yellow and drab, heavy and compact subsoil. Drainage is deficient as a whole.

The Papakating silty clay loam is brown to nearly black in the surface, with a yellowish-brown to slightly mottled, rather compact and heavy subsoil. Drainage is fair to good.

Muck and Marsh represent accumulations of organic matter. Muck is nearly black in color and is very deep. Marsh consists of a surface soil of muck, underlain at variable depths by gray to whitish marl with an abundance of small shells.

Meadow includes poorly drained and extremely variable bottom land. Steep broken land represents areas too broken and steep for farming.

Many of the soil types are deficient in organic matter; therefore, all available manure and occasional green crops should be plowed under to build up the humus content. While many of the soils are calcareous, lime should be used more extensively, especially with legume crops. The adaptation of various soil types to crops should be studied, and systematic crop rotations should be followed on each farm. The farms of the county as a whole have an appearance of prosperity.

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE
NEW YORK STATE COLLEGE OF AGRICULTURE
CORNELL UNIVERSITY

SOIL MAP

NEW YORK
CAYUGA COUNTY SHEET

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.

Secondary roads and Trails

Railroads, Steam and Electric

Bridges, Ferry

R.R. crossings, Tunnel

Ford, Dam

School or Church, Cemeteries

Mine or Quarry, Mine dumps, Made land

Bluff, Escarpment, Rock outcrop and Triangulation station

Stony and Gravelly areas

Soil boundaries

Boundary lines

Boundary lines

Boundary lines

U.S. township and section lines

RELIEF
(Printed in brown or black)

Contours, Depression contours

Prominent Hills, Mountain Peaks

Sand, Wash, and Sand dunes

Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

Streams

Lakes, Ponds, Intermittent lakes

Intermittent streams

Springs, Canals and Ditches, Flumes

Swamp, Salt marshes

Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

LEGEND

Allis stony silt loam — Al
Allis silty clay loam — Ac
Alton stony loam — Am
Canfield silt loam — Cs
Cazenovia silt loam — Ca
Chenango gravelly silt loam — Cl
Chippewa silty clay loam — Cc
Dunkirk very fine sandy loam — Dv
Dunkirk silt loam — Dl
Farmington silt loam — Fa
Genesee silt loam — Gl
Granby silty clay loam — Gs
Groton gravelly loam — Gm
Holly silty clay loam — H
Marsh — Ma

Honeoye silt loam — Hm
Gravelly phase — Hm+
Lansing silt loam — Ls
Lockport silt loam — Lo
Lordstown stony silt loam — Ll
Steep phase — Ll
Lyons silt loam — Lm
Lyons silty clay loam — Lc
Ontario loam — Ol
Smooth phase — Ol
Steep phase — Ol
Ontario silt loam — Os
Gravelly phase — Os
Palmyra gravelly silt loam — Pa
Meadow — M
Steep broken land — St

Papakating silty clay loam — Pl
Poygan silty clay loam — Pc
Schoharie silty clay loam — Ss
Schoharie silty clay — S
Tyler very fine sandy loam — Ty
Tyler silt loam — Th
Tyler silty clay loam — Tc
Volusia silt loam — Vl
Westbury stony loam — Wn
Wooster stony silt loam — Ws
Wooster gravelly silt loam — W
Worth loam — Wl
Smooth phase — Wl
Poorly drained phase — Wl
Muck — Mu

Soils surveyed by H. G. Lewis, in charge, E. F. Brookins, and R. L. Gillett of the U. S. Department of Agriculture, and F. B. Howe and D. F. Kinsman of the New York State College of Agriculture.

BASE MAP FROM
U. S. GEOLOGICAL SURVEY SHEETS

Scale 62500
1 0 1 2 3 Miles
1 0 1 2 3 4 5 Kilometers
Contour interval 20 feet.
Datum is mean sea level.

Field Operations
Bureau of Soils
1922